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CONTENTS

Phoma conidiogena, an excitant of asthma: some observations on the development and cultural characteristics (plates 14–16) ..... *Rhoda W. Benham* 203

Studies on the flora of northern South America—XV. Recent collections of Melastomataceae from Peru and Amazonian Brazil ..... *H. A. Gleason* 213

Thorn formation in Fouquieria splendens and Idria columnaris ..... *Robert R. Humphrey* 263

Index to American Botanical Literature 265

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Phoma conidiogena, an excitant of asthma: some observations on the development and cultural characteristics

RHODA W. BENHAM

(WITH PLATES 14–16 AND EIGHT TEXT FIGURES)

The fungus, a *Phoma*, which has been made the object of this study belongs to the Sphaeropsidales of the Fungi Imperfecti, having the asexual spores borne in a more or less globular fruit body, known as a pycnidium. It was obtained during an investigation of a case of asthma due to a fungus, being one of a number of forms which occurred on Petri dish cultures of maltose agar (Sabouraud) after exposure in places where the patient's asthmatic attacks were most severe. The fungus to which the patient had been shown to be most sensitive was an *Alternaria*, probably *Alternaria Mali* (Hopkins, Benham, and Kesten, 1930). Tests were made to see whether this *Phoma* form would produce asthmatic attacks; such was found to be the case: a most severe attack followed spraying the throat with an extract of this fungus. Skin sensitization was also shown. Interest was aroused in the culture, as it was found to have, associated with the pycnidial form, dark septate structures borne singly or in chains, resembling spores of *Macrosporium* and *Alternaria*.

A study was undertaken to determine the relation of the cells of the *Alternaria*-like form to the life cycle of the fungus. A brief report of the developmental and cultural characteristics of the strain follows.

Planchon (1900), in a study on the effect of various media on the growth of some dematious fungi, described a form which appears to be very like, if not identical with this fungus. He called his fungus *Alternaria polymorpha* because of its great variation in form. Planchon noted the formation of the pycnidium from a single cell, either from a cell of the yeast form which he described, or from a germinating pycnospore, or as he termed it, stylospore.

Schnegg (1915), in his study on the development and biology of pycnidia, gave a complete picture of the cultural characteristics and pycnidial development of a fungus which is also similar. He called it *Phoma conidiogena*, because of the type of pycnidial formation, which he described and illustrated very clearly. The pycnospores or conidia gave rise, by growth and division, to the mature pycnidium. He studied the fungus in hanging drop cultures and was able to trace the development of the pycnidium from the germinating spore. Von Tavel (1889) noted the formation of a pycnid-

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ium from a single ascospore of *Cucurbitaria Platani*, and referred to it as a sporo-pycnidium.

Planchon observed, as did Schnegg, that there are two types of pycnidial formation, that mentioned above, and the formation of the pycnidium from a cell or cells of a hypha. This later type Schnegg called secondary pycnidia. The development was, for the most part, according to Schnegg, of the meristogenetic type, though there may be also a combination of the meristogenetic and symphyogenetic types. Bauke (1876) had clearly described these two methods by which pycnidia may be formed. Kempton (1919) likewise gave a complete description of pycnidial formation for a number of forms and distinguished these types.

In addition to pycnidial formation, Planchon observed in his cultures bodies resembling the conidia of *Macrosporium* or *Alternaria*. Schnegg, too, wrote of the dark, thick-walled cells which resembled conidia of *Septosporium* or *Macrosporium* which he called 'Dauerzellen.' These developed from cutinized portions of the mycelium. More recently Brooks and Searle (1920), in an investigation of tomato mosaic, mentioned the discovery of a similar fungus which they named *Phoma alternariaceum*. This formed both pycnidia and *Alternaria*-like spores. This same strain was studied by Chodat (1926), who noted the similarity of the septate structures to spores of *Alternaria*. Brooks and Searle refer to two other species of *Phoma* in which *Alternaria*-like forms had been described: these were *Phoma Richardiae* and *Phoma fictilis*. They were included in a list of *Phoma* cultures described by Westerdijk and Van Luijk (1920).

GENERAL MORPHOLOGY AND CULTURAL CHARACTERISTICS OF THE PHOMA STUDIED

he fungus produces a heavy, septate mycelium which shows frequent branching and anastomosing. There is but slight production of aerial mycelium, and this varies greatly with the medium offered, being more abundant on media containing sugars, much less on Czapek's agar, and greatly reduced on corn meal. The greatest production of aerial mycelium occurs on wort agar. On this medium the fungus grows very compactly with thick short tufts of aerial hyphae. The pycnidia appear very soon after inoculating a culture, usually in 48 hours, and were abundant on all of the media used. The pycnidia were arranged more or less irregularly over the surface of the colony, lying between the hyphal branches. The shape and size shows great variation. They may be very elongated, oval, or spherical in form, usually with one ostiole, though sometimes two may be noted. The pycnospores, which are small, one-celled, usually hyaline spores, oval in

shape, appear in two to three days. Their size also varies with the medium used. They escape through the ostiole and accumulate about the opening in a more or less gelatinous or slimy mass (fig. 2). On sugar media or Czapek's agar the color is rose to pink as they are first formed, so that one notes these slimy colored masses scattered over the whole colony. Later the color changes to brown, then black. On corn meal agar, however, the pink color never appears, the entire growth is more scanty, the pycnidia as they form are quite separate, and the masses of spores appear tan-colored rather than rose-colored. They are golden to light brown at first and darken with age. Some of the spores appear to be quite dematious in character. Occasionally one finds dark spores that are two celled (fig. 1, B). The dark-colored septate structures resembling *Alternaria* spores appear somewhat later than the pycnidia. They begin to form usually at the end of a week, and are more abundant in the drier portions of the culture. They occur singly at the ends of lateral branches of the mycelium, or in long chains closely surrounding the pycnidia. They may be more or less simple in form as shown in figure 3 or more complex as in figure 4. They are usually thick-walled, highly granular, and of deep brown to black color. At the time that these cells form, the entire mycelium may become highly granular and show thickening of the cell walls, giving the appearance of chains of chlamydospores. These thick-walled cells darken, giving a comparatively simple form of resistant cells. Frequently one finds the peculiar hyphal coils so often present in fungus cultures which Schnegg pictures so carefully and terms 'Mycelschlengen.' Schnegg notes that the pycnospores also formed resistant cells, the 'Dauerconidia.' This is probably what is happening in the case of the two-celled, dark pycnospores mentioned above.

COLONY CHARACTERISTICS

The gross appearance of the colonies on various media may be seen in plate 15. On dextrose or honey agar, as noted above, the pycnidium formation is very abundant (fig. 10). The pycnospores escape and collect in great masses at the openings of the pycnidia. The pycnidia appear to run together and one finds a continuous border of shiny moist substance, consisting of spores, at first pink, later dark brown around the colony. A slight development of aerial mycelium is noted at the center and outer border of the colony. In two months old cultures the whole surface is covered with aerial mycelium (fig. 11).

On Czapek agar the aerial growth is more scanty. On this medium, also, as the pycnidia form and the spores are discharged, there is a decided rose-color to the colony. Later this color changes to brown, then black as noted above. A very excellent example of sectoring, or what Chodat called

saltation or mutation occurred (fig. 6). Two of these sectors were much darker in color and more compact in growth than the rest of the colony. These darker areas are made up of masses of the *Alternaria*-like spores with very few pycnidia, whereas the pycnidia are more abundant in the lighter areas. Transfers from these sectors and from the lighter portions of the

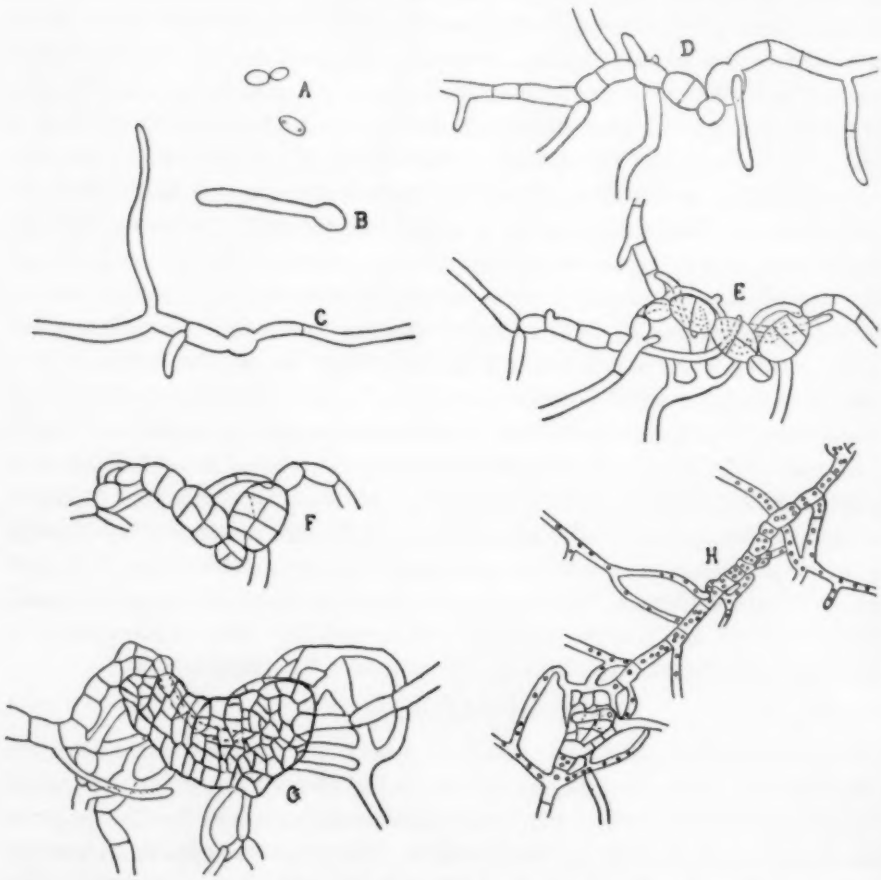


Fig. 12. Development of the pycnidium from a single pycnospore. (a) Mature pycnospore. (b) Germinating pycnospores after ten hours. (c) At 24 hours. (d) At 28 hours. (e) At 30 hours. (f) At 31 hours, and (g) at 34 hours. (h) Pycnidium formation from a hyphal cell. ×1500.

colony produce both pycnidia and muriform cells. The colonies obtained from the darker areas show a greater tendency to sector in turn, than those obtained from the lighter areas, or more normal portions of the colony. Chodat noticed this sectoring and followed carefully the further develop-

ment of the strains thus obtained, and reports a number of permanent races or mutants. Chodat concluded from his study that on media deprived of sugar it was more difficult to detect differences in his races.

On corn meal agar there is little growth of aerial mycelium but there is abundant production of pycnidia and *Alternaria*-like cells. This seems a favorable medium for the study of the organism as the mycelial growth is less abundant, and the medium being more or less transparent, development of fruiting structures can be watched closely. The pycnidia develop rapidly, being completely formed in two or three days. The mycelium is at first colorless, then as the pycnidia form, brownish spots can be observed scattered over the plate (fig. 7). At the center of the plate the pycnidia are irregularly scattered, but farther out, tend to form in zones, the colony being composed of numerous concentric rings (fig. 8). On plates three weeks or more old, the outer ring or border of the colony is much darker than the central portion, due to the greater production of the *Alternaria*-like cells in this region (fig. 9). There is also some tendency to sector on this medium. The color on corn meal is more of an olive green than brown or black. The *Alternaria*-like cells usually begin to appear at the end of a week or ten days and are very abundant in plates three to four weeks old. The pycnidia tend to be more spherical in shape on this medium (fig. 4) and somewhat smaller than on the sugar media. The pycnidium may be oval, having dimensions 64×80 microns, or spherical, 80 to 100 microns or more in diameter.

A few transfers were made to sterilized rose leaves and cherry twigs. On these the growth was very dark and consisted primarily of thick-walled brownish-black mycelia with abundant production of the *Alternaria*-like cells (fig. 5). Pycnidium development was greatly reduced.

MONOSPORE CULTURES

The fact that the muriform cells and the pycnidia were derived from the same mycelium was established by Brooks and Searle, who obtained monospore strains from pycnospores, which in turn produced both pycnidia and *Alternaria*-like structures. A single muriform cell was germinated, and it likewise produced both types of spores. In the present study twenty-eight monospore strains were obtained, fourteen from germinating *Alternaria*-like cells and fourteen from pycnospores. All of these monospore strains gave abundant development of pycnidia and *Alternaria*-like cells. Slight variations could be noted in the strains as to the depth of color produced and the tendency to form resistant cells, although the general appearance of all the strains was similar on corn-meal agar. One mono-

spore strain was selected at random for a more complete study of the development of the pycnidium, and this was compared with the original culture from time to time.

DEVELOPMENT OF THE PYCNIDIUM

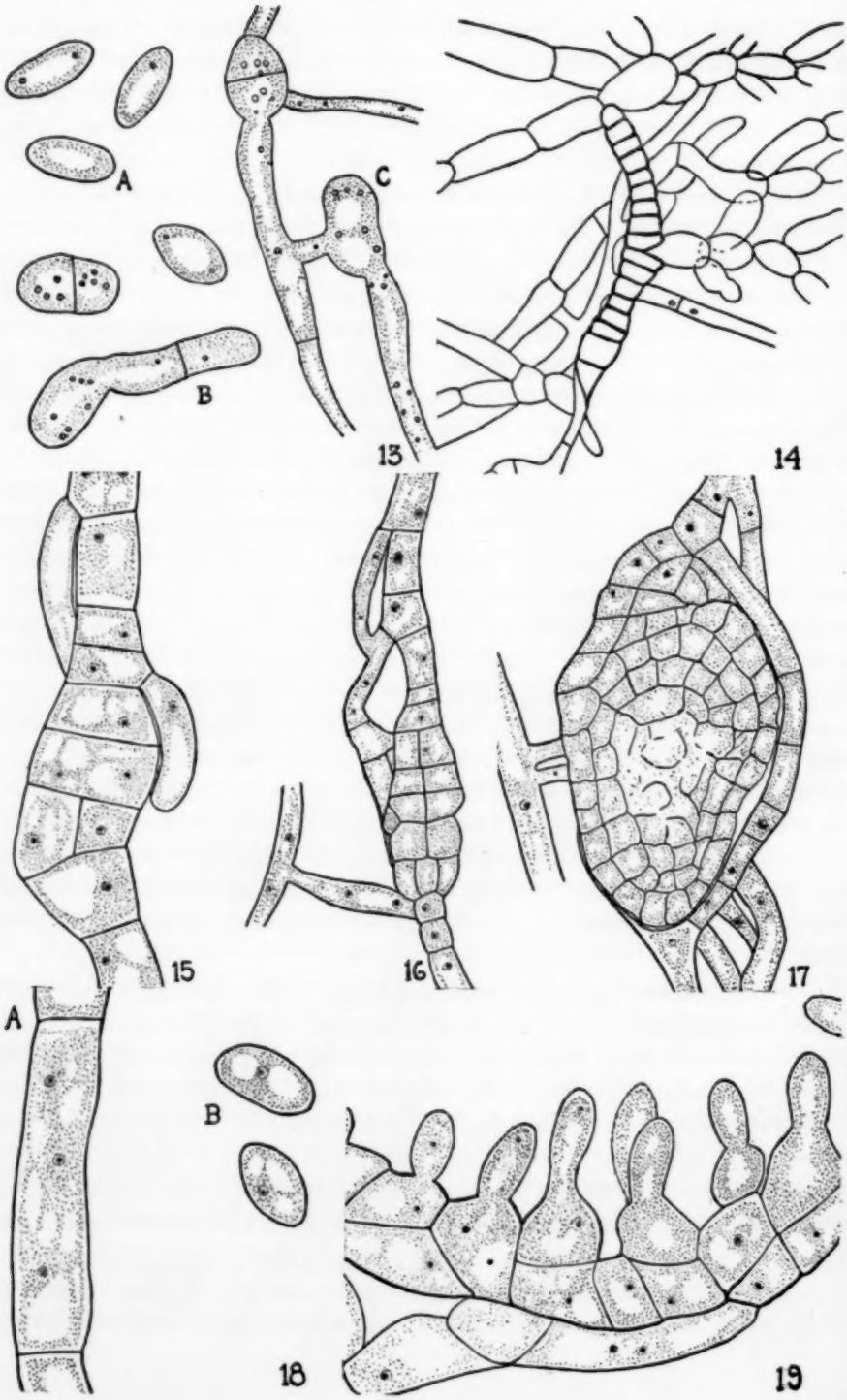
The development of the pycnidium was observed in hanging drops and in slide cultures. A drop of corn meal agar, or wort agar was placed on a cover slip or slide and inoculated with pycnospores, care being taken to have the sowing dilute. Observations were made from these cultures grown at room temperature. Within eight to twelve hours after sowing the spores germinate (fig. 12, B). At first one germ tube forms and several hours later the second one appears. Sometimes the pycnospores divide by a cross wall before germinating. The next step is the formation of a transverse wall in each germ tube, thus forming an elongated cell on each side of the original spore (fig. 12, C). The original spore and adjacent cells can readily be distinguished from the neighboring cells by their slightly thicker wall and more granular appearance. These cells continue to grow by transverse divisions in the original spore and in the adjacent cells. A chain of cells which are differentiated from the rest is formed (fig. 12, D). These are evidently the primordium of the pycnidium.[1] Side branches bud out from these cells and turn back to the primordium, thus forming the 'Hullhyphen' (Schnegg) which support and surround the pycnidium (fig. 12, E). Longitudinal walls now appear in the original spore and other cells of the chain (fig. 12, F). Development from here on is very rapid, division continuing until there is formed a compact, elongated parenchymatous mass of tissue which is readily recognized as a young pycnidium (fig. 12, G). The wall cells begin to darken and thicken. The process thus far takes about 48 hours. Within the next 24 hours ripe pycnospores are present and begin to discharge from the pycnidium. The pycnospores are oval to egg shape. At first the contents are homogeneous, later an 'oil drop' appears in each end of the spore (fig. 13). The spores are usually hyaline though dark spores have been noted at times; they vary in size depending somewhat upon the medium. From pycnidia found on corn meal they measured 5.35–5.8 microns×2.3 microns. On wort they are somewhat larger, being 7.2×4 microns; this last measurement agrees with those of Schnegg for the pycnidial spores of *Phoma conidiogena* grown on wort agar. He gave the measurements 7×3.5 microns. The pycnidia, formed in this manner, are large and vary in shape.

[1] Kempton states that the term primordium is used to designate a group of cells that have become so differentiated that it is clearly evident that from these a pycnidium or similar structure will arise.

Most are elongated though some appear almost spherical. In hanging drop cultures and slide cultures not all of the pycnidia become mature, undoubtedly due to unfavorable conditions. An identical development of pycnidia was observed from a germinating spore of the original strain. The development of these strains corresponds minutely with the type of pycnidium formation described for *Alternaria polymorpha* by Planchon and for *Phoma conidiogena* by Schnegg. It may be said to represent the extreme meristogenetic type of pycnidial formation.

The second type of pycnidium formation noted by Planchon and by Schnegg was also observed. A cell of the mycelium may divide, increase in size, become more granular and the wall thicker, thus indicating that it is to be the primordium of a pycnidium. This then continues to divide by transverse and vertical walls until a compact mass of tissue forms (fig. 12, H). Sections of early stages of pycnidia formed in this manner are shown in figures 15 and 16. Side branches from neighboring cells of the hyphae form and grow in toward the primordium. Sometimes branches from neighboring hyphae may take part in the development of this wall. Development here then is either of the simple meristogenetic type or a mixture of the meristogenetic and symphyogenetic types. The pycnidia formed by the second method are usually smaller than the others and tend to be spherical in shape. Usually there is one ostiole to each pycnidium and the spores when ripe, may be seen to escape one by one, often in a steady stream. Once free in the culture, as stated above, the spores appear to accumulate around the ostiole in a mass as if they were held together in some gelatinous matrix. Occasionally the pycnidium may be compound and form two or more ostioles. These pycnidia are usually irregular in shape and no doubt more than one primordium was involved in their origin. The wall of the pycnidium is dark in color, though the intensity varies with the medium.

The *Alternaria* type of cell rarely appears in slide cultures where pycnidia are abundant. They begin to appear, however, in cultures ten days or more old. Occasionally it was noted that if insufficient water was placed in the hanging drop culture, the pycnospore started to germinate and then terminated very rapidly in a dark-colored septate structure. This formation of resistant cells and spores varied. Often chains of highly granular, thick-walled, dark-colored chlamydospores appeared. The formation of these from the hyaline mycelium could be traced. The cells became more granular, developed more cross walls, with a thickening and darkening of the walls. Some of these cells then increased in size and developed longitudinal walls, thus forming the *Alternaria*-like structures. These cells often


A
B
C
13
14
15
16
17
A
B
18
19

appeared in chains of 8 or 10 or more. A germinating *Alternaria*-like cell is shown in figure 14. Further development of the pycnidium was studied from fixed and stained material.

CAVITY FORMATION IN THE PYCNIDIUM

Cultures from corn-meal agar plates were fixed in Flemming's weak solution diluted with an equal quantity of water and the addition of a drop of acetic acid. Sections showed that the cells of the hyphae are multinucleate and the septa numerous (fig. 18, A). Anastomosing was noted frequently. The cavity formation was not studied extensively, but appeared to begin by a breaking down of the tissue at the center of the small pycnidial knot (figs. 20–21). The cells next in line push toward the center and in turn disintegrate (figs. 17, 22). Elongated cells resembling sporophores are then observed extending into the cavity (figs. 23–24). These, the protosporophores, probably break down, though some of them may cut off spores (figs. 25–26). The cavity gradually increases in size and the tissue within it disappears until only a row of cells or sporophores is left inside the pycnidial wall. From these structures spores may be seen to form (figs. 19, 27, 28). Some stages show the sporophores extending into the cavity, which still contains stainable remains of the disorganized central tissue, suggesting perhaps that the food for the developing spores comes from within. In still older stages it is difficult to make out the sporophores. The mature pycnidium was found to consist of a definite wall of one or two layers, and the entire pycnidium filled with spores, arranged so that they pointed toward the center of the pycnidium with one end toward the ostiole. The spores appeared to be uninucleate and cut off from a sporophore extending into the pycnidial cavity (figure 18, B). The lysigenous cavity formation above described is similar to that described by Dodge (1923) for *Phyllostictina carpogena*. This is in contrast to schizogenous cavity formation where the cells of the central portion of the pycnidial primordium grow more slowly than those at the periphery, so that the cells at the center are torn apart. It would be difficult to exclude entirely growth inequalities in the present case, as it seems possible that they may have some influence in initiating the cavity formation.

Fig. 13. (a) Mature pycnospores. (b) Germinating pycnospores. (c) Anastomosing of germinating pycnospores. Fig. 14. Germinating *Alternaria*-like cell. Fig. 15. Early stage in development of a pycnidium from a hyphal cell as seen in section. Fig. 16. Later stage of development of pycnidia. Fig. 17. Median section of developing pycnidium, showing the breaking down of the tissue at the center. Fig. 18. (a) Section of a hyphal cell showing several nuclei. (b) Pycnospores showing nucleus. Fig. 19. Median section through mature pycnidium showing formation of spores from sporophores just inside the wall. All ×4000.

DISCUSSION

It would appear from this study that the species under discussion is similar to, if not the same as, that described by Schnegg. It would be very difficult unless one were able to study their cultures, to determine whether Planchon, Chodat, and Schnegg were dealing with the same species. If all had the same species the name given by Planchon (*Alternaria polymorpha*) would have priority. The fungus described is undoubtedly a *Phoma* and not an *Alternaria*, so that the name given by Schnegg, *Phoma conidiogena*, should have precedence, though the name *Phoma alternariaceum* might be preferable from a descriptive standpoint.

Most interesting and suggestive in this connection is the formation of the resting mycelium, such as was noted by De Bary (1887), in saprophytic forms. He states that

> It occurs in old and specially in starved mycelia, for example, of *Pleospora*, *Fumago*, and *Cucurbitaria*, in which the cells of the mycelium acquire thick and usually brown walls, store up reserve food material, and pass into a dormant state, and subsequently under suitable conditions, germinate as spores.

He then follows with a description of pycnidium formation, and mentions *Pleospora Alternariae* (Gibelli), stating that the identification of the species is not certain because of the absence of perithecia. A variety of forms seems to have been included under the name *Pleospora herbarum*, and it seems most probable that the species of that group which produces conidia of the *Alternaria* type might well be such a form as *Phoma conidiogena*. It would be interesting indeed if the perfect state of *Phoma conidiogena* proved to belong to the genus *Pleospora*.

SUMMARY

1. The fungus described belongs to the genus *Phoma*, possessing resistant cells similar in form to spores of *Alternaria*.

2. What appear to be similar species have been described previously by Planchon, Brooks and Searle, Schnegg, and Chodat.

3. Schnegg appears to be the first to place the fungus in the genus *Phoma*. This gives the name *Phoma conidiogena* precedence.

4. The development of the pycnidium from a single pycnospore has been traced. Upon germination the pycnospore forms two germ tubes. A cross wall forms in each tube, thus cutting off a cell on each side of the pycnospore. These cells and the pycnospore continue to divide until a chain of cells, differentiated by their thicker walls and more granular contents, is formed. These cells by continued growth and division form a

parenchymatous mass of tissue which develops into a pycnidium. This confirms the work of Planchon and Schnegg.

5. The formation of the cavity of the pycnidium and the production of the pycnospores has been studied. The cavity appears to originate by the breaking down of the tissue at the center of the pycnidial knot. The cells next in line push into the cavity thus made. These in turn disintegrate, and elongated cells or protosporophores extend into the cavity. The cavity increases in size by the breaking down of this sterile tissue. The mature pycnidium consists of one or two layers of wall cells, with a single sporophore layer, from which the pycnospores are cut off.

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Explanation of plates

PLATE 14

Fig. 1. Germinating pycnospores from corn-meal agar slide. (a) Anastomosing of pycnospores. (b) Dark-colored septate pycnospore. ×1500.

Fig. 2. Photomicrograph of corn-meal agar plate showing pycnidia and *Alternaria*-like cells. (a) Pycnospores massed about the ostiole. ×150.

Fig. 3. Resistant cells resembling spores of *Alternaria*. ×1500.

Fig. 4. Mature pycnidium and *Alternaria*-like cells. ×500.

Fig. 5. Production of *Alternaria*-like cells on cherry twig. ×500.

PLATE 15

Fig. 6. Sectoring in a two weeks old culture on Czapek agar.

Fig. 7. One week old culture on corn-meal agar. Pycnidia appear as black dots scattered over the culture.

Fig. 8. Pycnidia formation in concentric rings on corn-meal agar plates.

Fig. 9. One month culture on corn-meal agar, showing the characteristic dark border.

Fig. 10. Culture on dextrose agar, two weeks old, showing the broad shining border around colony due to masses of pycnospores.

Fig. 11. Aerial mycelium on dextrose agar plate two weeks old.

PLATE 16

Fig. 20. Section through young pycnidial knot. ×700.

Fig. 21. Section through young pycnidial knot showing beginning of breaking down of cells at center; also orienting of cells toward the center. ×700.

Fig. 22. Later stage showing cavity at center of pycnidial knot. ×700.

Fig. 23. Median section through young pycnidium showing elongated cells extending into cavity. ×300.

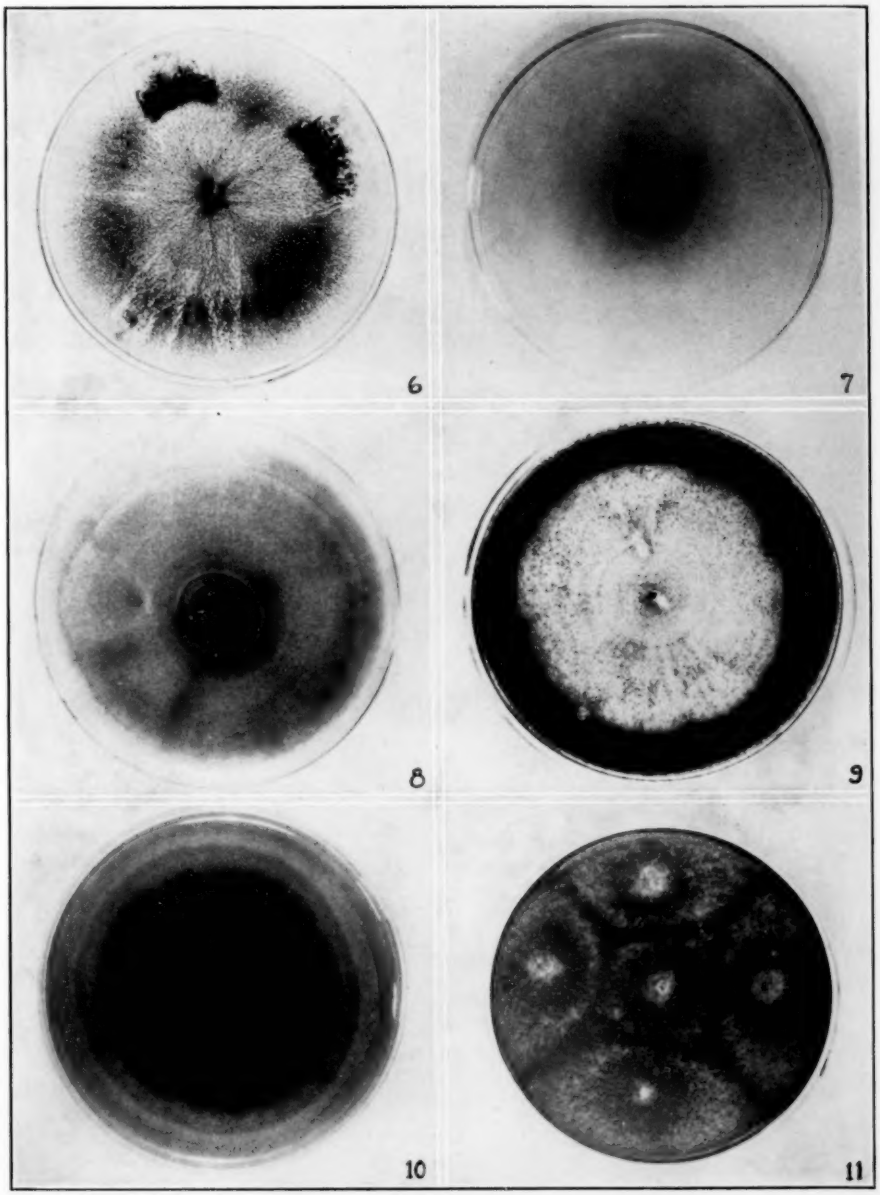
Fig. 24. Similar stage showing increase in size of cavity with border of elongated cells extending into the cavity. ×300.

Fig. 25. Median section showing cavity formation of ostiole. ×300.

Fig. 26. Median section of pycnidium. Elongated cells or protosporophores extending into the cavity. Some mature spores in the cavity. ×300.

Fig. 27. Median section of mature pycnidium showing wall of two layers with spores arising from sporophore just inside the wall. ×700.

Fig. 28. Mature pycnidium from which spores have escaped. ×700.



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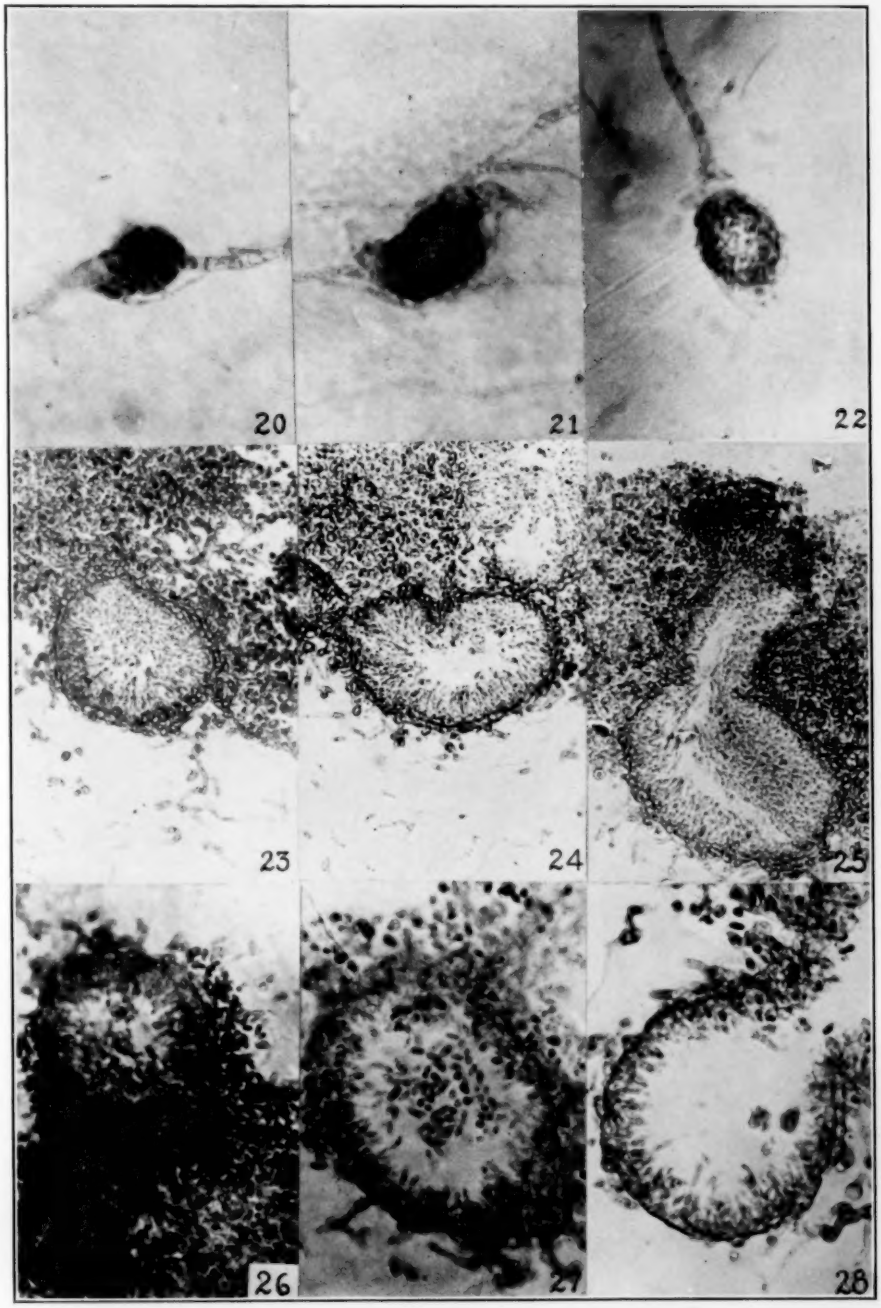

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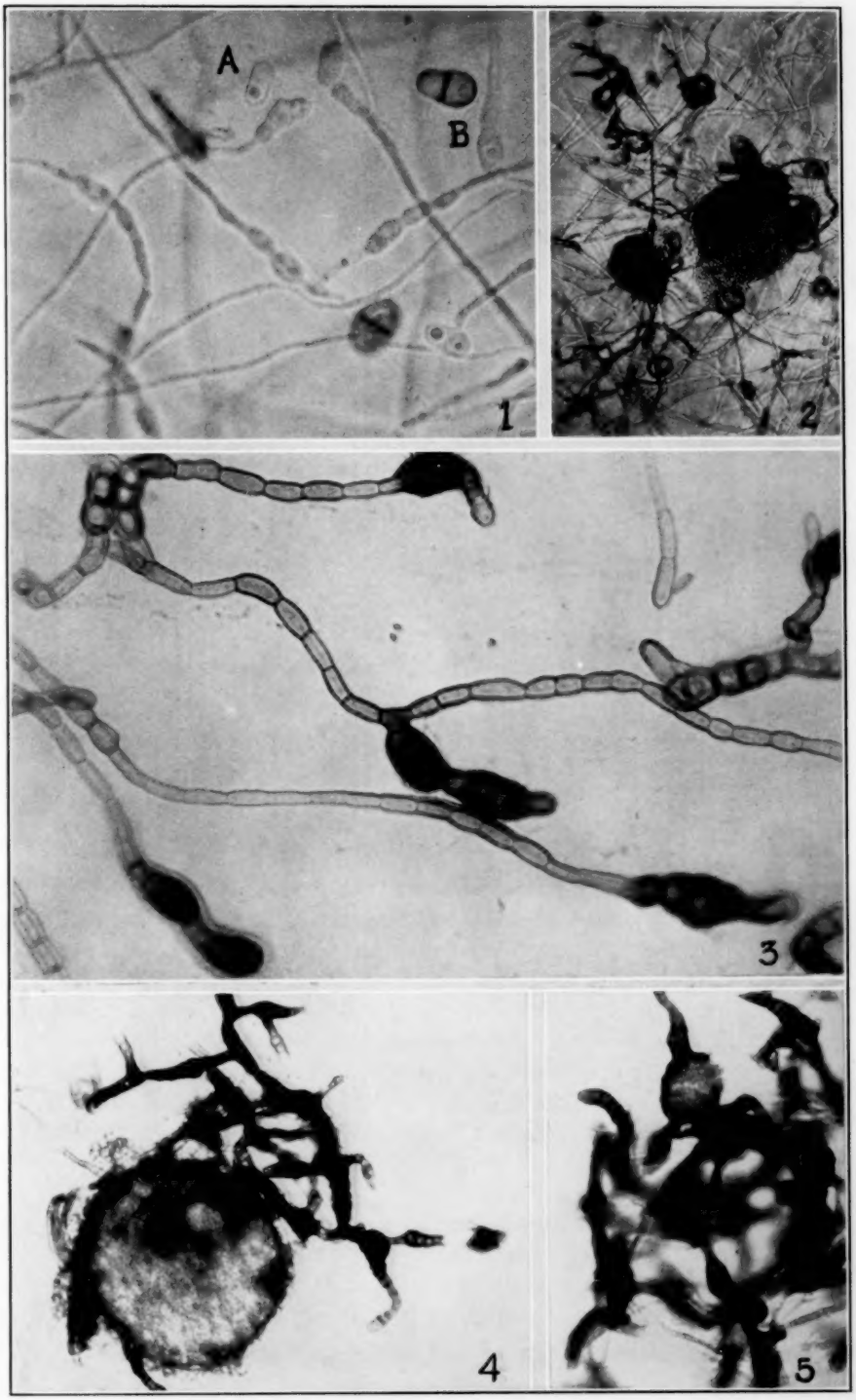

BENHAM: PHOMA CONIDIOGENA

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Studies on the Flora of Northern South America—XV. Recent collections of Melastomataceae from Peru and Amazonian Brazil

H. A. Gleason

Mr. E. P. Killip, of the Smithsonian Institution, and Mr. A. C. Smith, of the New York Botanical Garden, landed at Callao, Peru, in April, 1929, travelled overland and by boat across the Andes to Iquitos, and thence by steamer down the Amazon to Pará, collecting in the departments of Ayacucho, Junín, and Loreto, Peru, and in the vicinity of Manáos and Pará, Brazil. Mr. Llewellyn Williams, of the Field Museum, reversed this route, collecting at Pará and extensively in Dept. Loreto, entering the Andes in Dept. San Martín, and collecting in the vicinity of Tarapoto. Mr. G. Klug, of Iquitos, has more recently made considerable collections in the vicinity of Iquitos. A few other collectors have also supplied smaller quantities of material.

These collections have been of particular interest, since the localities are essentially the same as those of Poeppig, Spruce, Ule, and Tessmann, whose material has furnished the types for numerous species and is generally poorly represented in American herbaria. The arrangement below follows the well known taxonomic sequence of Cogniaux' Monograph, and the principal collectors are cited merely by their initials, *KS*, *W*, and *K*. All collections cited are in the herbarium of the New York Botanical Garden, unless definitely stated otherwise.

Microlicia Don

Microlicia sphagnicola sp. nov. §*Pseudomicrolicia;* ramis dichotomis, juventute tetragonis dense glandulosis ad nodos setosis, mox denudatis subtetragonis setis persistentibus; foliis ad summum ramorum confertis internodis brevibus, coriaceis sessilibus revolutis ellipticis 3-nerviis utrinque punctatis; floribus paucis terminalibus 4-meris, pedicellis brevibus glandulosis; hypanthio obconico 8-costato glanduloso superne 4-setoso; sepalis ovato-lanceolatis ad mediam marginemque glandulosis aristatis; petalis rotundato-obovatis margine glandulosis; staminum exteriorum majorum connectivo infra insertionem filamentae longe producto truncato, interiorum breviter producto obtuso; ovario 3-loculare, stigmate punctiforme.

Shrubby, about a meter high, freely dichotomously branched; young stems sharply 4-angled with concave sides, densely glandular with short stout hairs, with about 4 very slender erect setae between each pair of leaf-bases on each side; internodes 1 mm. long; older stems leafless, with persistent setae; leaves rigid, coriaceous, sessile, narrowly elliptic, 5–7 mm. long, 2 mm. wide, acute at both ends, with revolute margin 0.2 mm. wide, 3-nerved with an

obscure marginal pair, densely pulverulent on both sides with cylindrical bodies 0.3 mm. high; secondaries obscure and crooked; flowers few, 4-merous, solitary in the uppermost axils, apparently terminal but becoming lateral by proliferation of the main axis; pedicels obscurely 4-angled, 1.3 mm. long, glandular like the stem; hypanthium obconic, 3.4 mm. long, with 8 low rounded ribs, densely glandular-punctate, bearing an erect purple seta 2 mm. long at each sinus; calyx-tube prolonged 0.5 mm., to rounded sinuses; sepals ovate-lanceolate, 2 mm. long, acute, sparsely glandular along the thickened center and densely glandular on the margin, ending in an awn 0.7 mm. long; petals pink, broadly rotund-obovate, 6–7 mm. long and wide, flabellately veined above a 7-nerved base, finely glandular on the margin; filaments nearly straight, 3.4–3.7 mm. long, glabrous, slightly flattened; anthers of episepalous stamens oblong, 2.2–2.4 mm. long, including the stout straight beak 0.6 mm. long, the connective prolonged 2.8 mm. below the anther and gradually widened to the insertion of the filament, below the filament prolonged 1.7 mm. into a thick, flattened, obovate, truncate, obscurely 5-lobed organ 1 mm. wide; anthers of the epipetalous stamens 1.9 mm. long, including the beak 0.3–0.4 mm. long, the connective prolonged 1.8 mm. to the filament, gradually thickened but not flattened, below the filament prolonged 0.6 mm. in an obtuse ovoid-oblong lobe; ovary free, oblong-ovoid, 2 mm. long, 3-celled, obscurely 8-ribbed and 4-lobed at the summit; style 4 mm. long, slender, terete, glabrous, with a punctiform stigma.

Type, *KS 25680*, collected in an open sphagnum swamp at Eneñas, on the Pichis Trail, Dept. Junín, Peru, alt. 1700 m.; the species was noted as a characteristic plant of this swamp. It is related to *M. Weddellii* Naud., also of Peru, and differs from it in its entire leaves and shorter and broader sepals.

RHYNCHANTHERA DC.

RHYNCHANTHERA HOOKERI Naud. Dept. San Martín, San Roque; *W 7283.*

Rhychanthera Williamsi sp. nov. Ramis obscure 4-angulatis brevissime glanduloso-hirtellis; petiolis brevibus crassis dense glandulosis et hirsutis; foliorum laminis anguste ovatis acuminatis basi subcordatis serrulatis 7-nerviis, supra sparse pilosis praecipue secus venas, subtus ad venas venulasque pubescentibus; cymis confertifloris bracteosis, pedicellis brevissimis; hypanthio tubuloso ad faucem ampliato dense glanduloso-hirtello; sepalis erectis triangulari-lanceolatis quam hypanthio paullum brevioribus; petalis late rotundatis ad apicem aristatis; staminibus sterilibus filiformibus ad apice recurvatis; staminum fertilium filamentis crassis; antheris lanceolato-ovoideis longe rostratis; connectivo basi breviter producto ad insertionem filamenti minute tuberculato; ovario subcylindrico superne glanduloso-pubescente; stylo gracile usque mediam glanduloso-puberulente; stigmate punctiforme.

Stems subherbaceous, apparently erect, glandular-hirtellous with hairs 0.3 mm. long and very sparsely hirsute with simple hairs 1.5 mm. long; petioles stout, 6–10 mm. long, very densely glandular-hirtellous and freely hirsute, increasingly so above; blades firm, narrowly ovate, as much as 5 by 3 cm., acuminate, finely serrulate with glandular-setose teeth, subcordate at base, 7-nerved or barely 9-nerved, sparsely pubescent above, chiefly near the primaries, with incurved hairs 0.4 mm. long, much more freely pubescent with similar hairs beneath, especially on the veins; cymes small and crowded, subtended by lanceolate bracts; pedicels about 1 mm. long; hypanthium tubular, somewhat expanded at the throat, 4.5 mm. long, glandular-punctate and densely glandular-hirsute with hairs 0.4–0.5 mm. long; calyx-tube prolonged 0.2 mm.; sepals erect, triangular-subulate, 3.4 mm. long, minutely aristate, pubescent externally like the hypanthium; petals rotund, 5 mm. long and wide, with a subulate acumen 0.4 mm. long; sterile stamens filiform, 3.3 mm. long, hooked at the end; filaments stout and thick; anthers lanceolate-ovoid, 3.6 mm. long, the slender beak 4.7 mm. long; connective stout, prolonged 1 mm. to the filament and at base minutely tuberculate on the anterior side; ovary subcylindric, 3-celled, densely glandular in the upper half; style slender, 6.5 mm. long, glandular-pubescent on the lower half; stigma punctiform.

Type, *W* 7284, collected at San Roque, Dept. San Martín, Peru, alt. 1350–1500 m. It is a member of § *Isostemones* and obviously related to *R. Hookeri* Naud., which has a hispid stem, shorter and spreading sepals, longer and narrower petals attenuate at the base, shorter anther-beak, a slender and more elongate connective 2-toothed at the base, ovoid ovary, and much longer style.

ARTHROSTEMMA R. & P.

ARTHROSTEMMA GRANDIFLORUM Markg. Dept. Ayacucho: *KS 23082, 23114;* Dept. Junín: *KS 23572, 23932, 25225, 26618;* Dept. Loreto: *KS 29160.* There is no doubt that these seven specimens may be properly referred to this species, but there is some doubt whether the species can be maintained after thorough study of the genus. Markgraf certainly had little material available for comparison when he proposed it, the Berlin herbarium containing in 1930 only seven sheets from South America, in comparison with seventeen at Kew and thirty at New York.

ERNESTIA DC.

ERNESTIA QUADRISETOSA Berg. Dept. San Martín, Tarapoto (type locality): *W 5989;* Dept. Loreto, Balsapuerto: *KS 28600.*

NEPSERA Naud.

NEPSERA AQUATICA (Aubl.) Naud. Manáos: *KS 30054;* at or near Pará: *KS 30308, 30409; Dahlgren & Sella 315.*

DESMOCELIS Naud.

DESMOCELIS VILLOSA (Aubl.) Naud. Dept. San Martín, San Roque: *W 7118, 7410.*

BRACHYOTUM Triana

BRACHYOTUM LYCOPODIOIDES Triana. Dept. Amazonas: *W 7587.*

BRACHYOTUM QUINQUENERVE (R. & P.) Triana. Dept. Ayacucho: *KS 22272, 22333;* Dept. Junín: *KS 24131, 24448.*

BRACHYOTUM TRIANAEI Cogn. Dept. Amazonas, Chachapoyas: *W 7572.*

PTEROGASTRA Naud.

PTEROGASTRA DIVARICATA (Bonpl.) Naud. Dept. San Martín, San Roque: *W 7116, 7643.*

PTEROLEPIS Miq.

PTEROLEPIS PUMILA (Bonpl.) Naud. Near Pará: *KS 30416.*

PTEROLEPIS TRICHOTOMA (Rottb.) Naud. Near Pará: *KS 30490, Dahlgren & Sella 319, 346.*

TIBOUCHINA Aubl.

TIBOUCHINA ASPERA Aubl. Dept. San Martín: *Williams 7648.*

Tibouchina decora sp. nov. § *Diotanthera;* fruticosa, ramis dense et breviter strigosis; foliis mediocris ovato-oblongis acutis integris basi rotundatis 5-nerviis supra dense velutino-strigosis subtus dense et molliter villosis ad venas strigosis; cymis satis multifloris strigosis, bracteis anguste lanceolatis; floribus 5-meris; hypanthio anguste campanulato dense strigoso quam pedicello longiore; sepalis quam hypanthio paullum brevioribus triangulari-lanceolatis strigosis ciliatis; filamentis glabris; antheris paullum inaequalibus connectivo basi breviter producto antice bilobato; ovario 5-loculare superne strigoso, stylo elongato glabro.

Stems shrubby, rather sparsely branched, densely strigose with pale brown incurved hairs about 0.5 mm. long, from subulate or papillose bases; petioles 7–11 mm. long, pubescent like the stem; blades rather thick, ovate-oblong, 35–55 mm. long, 18–25 mm. wide, acute, entire or rarely minutely serrulate, rounded at base, 5-nerved, the outermost laterals arising just above the base of the intermediate pair; secondaries obscure above, very numerous, ascending arcuately at an angle of about 60°; upper surface densely velutinous with curved-ascending hairs 0.5 mm. long and about 0.2 mm. apart; lower surface gray and densely sericeo-villous, especially on the secondaries, and strigose on the primaries with closely appressed hairs 1 mm. long; inflorescence compact and many-flowered, densely sericeous, bracts linear-lanceolate, about 1 cm. long; hypanthium longer than the pedicel, tubular-campanulate, 7 mm. long, densely strigose or subsericeous with incurved hairs 1–1.5 mm. long and

with a spreading or ascending seta at each sinus; calyx-tube prolonged 0.8 mm. to sharp acute sinuses; sepals triangular-lanceolate, 5.5 mm. long, strigose down the midvein, densely ciliate, crimson within; petals magenta, broadly triangular-obovate, 12 mm. long, 8.5 mm. wide, obliquely truncate, freely ciliate; filaments glabrous, 7 or 9 mm. long; anthers subulate, nearly straight, 7 or 9 mm. long; connective 1 or 1.5 mm. long, incurved, deeply canaliculate ventrally and dilated at base into 2 short rounded anterior lobes; ovary 5-celled, ovoid-fusiform, 4.8 mm. long, glabrous below, densely strigose in the distal fourth; style slender, curved above, glabrous, about 15 mm. long; stigma punctiform.

Type, *KS 22700*, a shrub 3–7 ft. high, in thickets at Aina, between Huanta and Río Apurimac, Dept. Ayacucho, Peru, alt. 750–1000 m. Other specimens are *KS 24230*, *24791*, and *24979*, from Dept. Junín at altitudes between 680 and 2400 m. This species is probably the same as a collection of Pearce at Kew, labeled *T. panicularis* (Naud.) Britton, but obviously not of that species, which has 7-pli-nerved leaves and a much coarser pubescence. In the form and pubescence of its leaves it closely resembles *Rusby 2327* from Yungas, Bolivia, and differs chiefly in its much larger flowers. Rusby's plant has been erroneously identified as *T. panicularis*. *T. decora* is probably more closely related to *T. Brittoniana* Cogn., also from Yungas, but differs in many characters of size, form, and pubescence.

TIBUOCHINA LAXA (Desr.) Cogn. Dept. Amazonas, Chachapoyas: *W 7573.*

TIBOUCHINA LONGIFOLIA (Vahl) Baill. Dept. Ayacucho: *KS 22499, 23075;* Dept. San Martín: *W 6364, 7151;* Dept. Junín: *KS 23567, 23789, 24968, 25197, 25278;* Dept. Loreto: *KS 27848, 29216.*

TIBOUCHINA OCHYPETALA (R. & P.) Baill. Puyash: *Sawada 95;* Dept. San Martín: *W 5953, 6385, 6492.*

TIBOUCHINA TESSMANII Markg. Dept. Loreto: *KS 28618, 29210.*

COMOLIA DC.

COMOLIA VERONICAEFOLIA Benth. Near Pará: *KS 30617.*

ACIOTIS Don

ACIOTIS BRACHYBOTRYA (DC.) Triana. Dept. Junín, Pichis Trail: *KS 25892.*

ACIOTIS DYSOPHYLLA (Benth.) Triana. Dept. Loreto: *KS 26888, 29852, W 1447, 1486, 1710, 1712, K 1188;* Manáos: *KS 30088;* Pará: *KS 30367.*

ACIOTIS INDECORA (Bonpl.) Triana. Dept. Loreto, Manfinfa on the upper Río Nanay: *W 1179, 1180.*

ACIOTIS PURPURASCENS (Aubl.) Triana. Dept. Junín: *KS 26229;* Dept. Loreto: *KS 26958, 28173, 28206, K 144, 1489, W 463, 803, 883, 1185, 1276, 1474, 1485, 1930, 2568, 2701, 3209, 3813, 4739, 7848;* Manáos: *KS 30055.*

MONOCHAETUM Naud.

Monochaetum subglabrum sp. nov. Grex *Dicranantherae;* frutex ramosus metralis, ramis parce pilosis; petiolis gracilibus strigosis; laminis ovatis acutis basi late cuneatis, 5-pli-nerviis, supra inter venas parce pilosis, subtus ad nervos strigosis ceterum parce pilosis; inflorescentia ramosa multiflora subglabra; hypanthio tubuloso-campanulato inferne glabro superne parce piloso; sepalis triangulari-lanceolatis quam hypanthio paullum longioribus acutis glabris ciliatis; petalis obovatis; antheris minoribus rectis appendice oblanceolata, majoribus arcuatis appendice arcuata sursum dilatata; ovario summo corona pilorum ornato.

Stems shrubby, 6–15 dm. high, freely branched, very sparsely pilose with simple hairs about 1 mm. long and 2–3 mm. apart; petioles slender, 1–2 cm. long, sparsely strigose; leaf-blades thin, ovate, as much as 45 by 28 mm., rounded below to a short cuneate base, acute or subacuminate, 5-pli-nerved, the upper surface sparsely pilose between the veins, the hairs 1–1.5 mm. long and not overlapping, the lower surface very sparsely pilose, more densely strigose on the veins where the hairs are 1–1.3 mm. long and overlapping; upper leaves much reduced, proportionately narrower, and acuminate; inflorescence freely branched, many-flowered, the smaller branches essentially glabrous; hypanthium tubular-campanulate, 4 mm. long, glabrous below, sparsely pilose around the summit with simple hairs 0.5–1 mm. long; sepals triangular-lanceolate, 4.5 mm. long, 1.6 mm. wide at base, sharply acute, glabrous on both sides, finely ciliate and short-setose at the tip; petals white or pink, obovate, 6–7 mm. long, glabrous; filaments 6 or 8 mm. long; small anthers straight, 4.3 mm. long, the appendage oblanceolate, obtuse, flat, 3.5 mm. long; large anthers strongly arcuate, 6 mm. long, the arcuate appendage 4 mm. long, dilated toward the summit, somewhat channeled on the concave side; ovary free, ovoid, glabrous, except at the summit, where it bears 12–16 erect hairs 0.7 mm. long; style 4 mm. long; stigma punctiform.

Type *KS 22325*, collected at Ccarrapa, Dept. Ayacucho, Peru, alt. 1500 m.; other specimens by the same collectors are *22299*, from the same locality, alt. 2500 m., and *24423*, from Carpapata, Dept. Junín, alt. 2700–3200 m. The species is closely related to *M. dicranantherum* (R. & P.) Naud., which has much denser spreading pubescence on the stem, leaves, and hypanthium and shorter and much broader sepals.

ADELOBOTRYS DC.

Adelobotrys macrantha sp. nov. Ramis crassis obtuse 4-angulatis et sulcatis brunneo-strigosis mox glabrescentibus; petiolis amplis crassis; foliorum

laminis magnis ellipticis utrinque acutis 5-nerviis supra primum sparsissime strigosis mox glabris subtus tenuiter strigosis; paniculis magnis dense strigosis; pedicellis hypanthio brevioribus in eum gradatim dilatatis; hypanthio magno obconico strigoso; calycis limbo patulo, sepalis brevibus late rotundatis, dentibus exterioribus minutis; petalis magnis; staminibus fere isomorphis, calcare basale series exterioris incurvo series interioris erecto, calcare dorsale canaliculato breviter bifido; ovario 4-loculare; stylo terete, stigmate truncato.

Branches stout, roundly 4-angled and deeply sulcate when young, the uppermost internodes densely brown-strigose with short hairs, the lower glabrous; petioles stout, 3–5 cm. long, closely but completely pubescent; blades thin, elliptic, as much as 14 by 25 cm., even on the uppermost nodes, abruptly acuminate, densely brown-ciliate, broadly acute at base, 5-nerved; primaries lightly impressed above, elevated and prominently strigose beneath, secondaries plane above, lightly elevated beneath, 5–7 mm. apart, arising at an angle of 70–80° and somewhat outwardly arcuate, minutely strigose beneath; upper surface very sparsely strigose when young, soon glabrescent; lower surface thinly strigose with brown hairs; panicles ample, densely strigose, 15–25 cm. long, the umbels mostly 5–7-flowered; pedicels about 5 mm. long, gradually expanded into the hypanthium; hypanthium obconic, leathery, 9 mm. long to the torus, freely brown-strigose; calyx-tube flaring, prolonged about 3 mm., nearly glabrous; sepals depressed semicircular, about 0.7 mm. long, very minutely ciliate, the external teeth minute conic adnate thickenings; petals pink, cuneately and obliquely obovate, about 19 mm. long and 10 mm. wide, flabellately veined; filaments flat, 12–13 mm. long; anthers nearly straight, the epipetalous 13.5, the episepalous 8.5–9 mm. long; dorsal spur nearly straight, 4–5 mm. long, channeled on the lower side, bifid, the lobes subulate, connivent, 0.8 mm. long; basal spur 2–3 mm. long, erect in the epipetalous, incurved in the episepalous stamens; ovary stoutly ellipsoid or somewhat obovoid, 4-celled; style slender, 16 mm. long, not tapering, stigma truncate; fruiting hypanthium and calyx about 15 mm. long, the seeds very slenderly clavate, 2 mm. long, with the embryo near the center.

Type, *KS 26745*, collected at Cahaupanas, on the Río Pichis, Dept. Junín, Peru, alt. about 340 m. It is described as a shrub 15–20 ft. tall, growing in dense forest, with rich pink petals and yellow anthers. A second specimen is *KS 29496*, from San Antonio on the Río Itaya, Dept. Loreto, alt. about 110 m., in fruit, described as a slender tree 10–12 ft. high; a sterile specimen, *KS 29616*, from Soledad on the Río Itaya, described as a subligneous vine, has also been referred here because of similarity in foliage and pubescence. The species is well distinguished from other known species of the genus by its large leaves and flowers, its minute exterior calyx-teeth, its nearly isomorphic anthers, and the short lobes of the dorsal spur.

The same species was previously collected by Tessmann, no. *4181*, and

distributed as *A. fuscescens* Triana, which has much smaller flowers with long exterior calyx-teeth.

ADELOBOTRYS MACROPHYLLA Pilger. Dept. Loreto, La Victoria: *W 2914, 2915.*

ADELOBOTRYS PRAETEXTA Pilger. Dept. Loreto, Santa Ana on the upper Río Nanay: *W 1231.*

Adelobotrys subsessilis, sp. nov. Ramis gracilibus juventute strigosis mox glabrescentibus; foliis brevissime petiolatis anguste oblongo-lanceolatis acutis basi rotundatis integris 3-nerviis, supra juventute sparse strigosis glabrescentibus, subtus ad venas dense inter venas sparse brunneo-strigosis; paniculis racemiformibus dense strigosis, ramis lateralibus ad apicem umbellam 5-floram gerentibus; floribus pedicellatis; hypanthio obconico dense strigoso; sepalis late oblongis membranaceis ciliatis, dentibus exterioribus patulis crasse conicis strigosis; staminibus subisomorphis; antheris subulatis arcuatis dorso calcare simplice ornatis, connectivo basi in calcar breve erectum conicum producto.

Stem subterete, loosely strigose above with malpighian hairs, the ascending arm 1–1.5 mm., the descending 0.8 mm. long, all deciduous with age and increasing distally to the inflorescence; internodes 3–5 cm. long; petioles about 2 mm. long, densely hirsute with similar but spreading hairs; blades membranous, lance-oblong, 5–7 cm. long, 1.5–2 cm. wide, subacuminate, rounded at base, entire, 3-nerved with 2 additional submarginals, the secondaries and tertiaries obsolete, upper surface minutely but densely verruculose and evanescently strigose, lower surface densely brown-strigose with malpighian hairs on the primaries and thinly so in 2 intervenal and 2 marginal strips; panicle compact, 10 cm. long, the short lateral branches bearing 5-flowered umbels, densely strigose throughout; pedicels about 5 mm. long, densely strigose; hypanthium obconic, 5.6 mm. long to the torus, 10-ribbed, minutely glandular-punctate, freely brown-strigose; calyx-tube flaring, rather thick, 1 mm. long, elevated at the center of each sepal into spreading, stoutly conic exterior teeth 0.8 mm. long and densely strigose; sepals membranous, depressed-oblong, 0.5–0.6 mm. long by 2 mm. wide, minutely ciliate; petals pink, broadly obovate, 9 mm. long, 5 mm. wide, somewhat inequilateral, retuse, flabellately many-nerved; filaments straight, erect, flat, 7.5 mm. long; anthers subulate, the episepalous slightly arcuate, 6 mm. long, the dorsal spur stout, oblong, nearly terete, 2.4 mm. long, the connective prolonged below the filament into an erect, stoutly conic, obscurely bilobed spur 1.5 mm. long, the epipetalous anthers similar, strongly arcuate, 7 mm. long, the dorsal spur slender, 2.6 mm. long, the basal spur 1.3 mm. long, not lobed; ovary free, 5-celled, minutely 5-lobed below the rounded summit; style slender, 9 mm. long, bent laterally just below the summit; stigma punctiform.

Type, *KS 27147*, collected at Iquitos, Dept. Loreto, Peru, alt. about 100 m.; it is described as a slender shrub 10–12 ft. high. Its narrow, sub-

sessile leaves with longitudinal strips of deep brown hairs and its racemiform panicles give it an aspect different from any other species in the genus.

ADELOBOTRYS TESSMANNII Markg. Terr. Caquetá, Colombia: *Woronow & Juzepczuk 6375*.

ADELOBOTRYS sp. Dept. Loreto, Balsapuerto: *KS 28501*. Although described as having pink petals and yellow anthers, our specimens do not show flowers. The plants impress me as shade forms of some other species and will not be described as new.

ADELOBOTRYS sp. Dept. San Martín, San Roque: *W 7108*, a fruiting plant.

MERIANIA Sw.

Meriania intonsa sp. nov. §*Adelbertia:* ramis scandentibus hirsutis, internodis elongatis; petiolis brevibus crassis dense hirsutis; foliorum laminis ellipticis mediocribus abrupte acuminatis tenuiter serrulatis basi subcordatis 5-nerviis, supra dense longeque pilosis, subtus ad venas hirsutis ad paginam breviter pilosis; inflorescentia terminale sessile pauciflora capitata, bracteis sessilibus cordato-ovatis hirsutis circumdata; floribus 5-meris subsessilibus; hypanthio anguste obconico 10-costato sparse strigoso-hirsuto; calycis limbo margine undulato; dentibus exterioribus longissimis hirsutis aristatis; petalis parvis obovatis; staminibus isomorphis; antheris subulatis paullum arcuatis poro unico dehiscentibus; connectivo deorsum in calcar breve conicum et sursum in calcar dimidio antheris aequante producto; ovario 5-loculare.

Stems climbing, slender, irregularly hirsute with crooked brown hairs 1–2 mm. long, becoming glabrous below, the internodes 4–8 cm. long; petioles stout, 6–13 mm. long, densely hirsute; leaf-blades thin and soft, elliptic or ovate-elliptic, as much as 85 by 55 mm., abruptly short-acuminate, subcordate at base, shallowly serrulate, at least below the middle, 5-nerved; upper surface pilose with yellowish hairs about 3 mm. long and 1 mm. apart, the secondaries obsolete; lower surface sparsely pilose with slender hairs 1–1.7 mm. long and 1–1.5 mm. apart, the primaries strigose-hirsute with brown hairs 3 mm. long, the secondaries obscure, about 5 mm. apart; inflorescence terminal, sessile, capitate, several-flowered, 1–2 cm. long, subtended by several sessile, cordate-ovate, acute, hirsute bracts 5–8 mm. long; pedicels 1–2 mm. long, sparsely hirsute; flowers 5-merous; hypanthium narrowly obconic, 4.2 mm. long, 10-costate, sparsely strigose-hirsute with brownish hairs 0.5–1 mm. long; calyx-tube spreading, 1 mm. wide; sepals thin and membranous, round-ovate, rounded at the tip, 0.3–0.6 mm. long; exterior teeth subulate, curved outward and upward, 3.6 mm. long, hirsute, tipped with a straight awn 4.8 mm. long; petals (not fully expanded) obovate, 5 mm. long, 4 mm. wide, broadly rounded above, freely nerved; stamens isomorphic; filaments (not fully expanded) flattened, 2 mm. long; anthers subulate, somewhat outwardly arcuate, 3 or 5.6 mm. long, opening by a single pore; connective 2-spurred at base, the

basal spur conic, 0.7 mm. long, the dorsal linear, 2–2.2 mm. long, minutely 2-lobed at the apex, closely appressed to the anther; ovary slender, free, glabrous, 5-celled; style 4 mm. long; stigma capitate.

Type *KS 29969*, collected at Mishuyacu, near Iquitos, Dept. Loreto, Peru; other specimens from the same locality are *K 90* and *1334*. The elongated exterior teeth of the calyx and the sessile inflorescence show that it is related to *M. prunifolia* D. Don, which lacks the long pubescence of the stem, leaves, and hypanthium, has much smaller obtuse leaves, and solitary flowers. The color of the petals is described on the three sheets as white, lilac, and cream. The width of the leaves varies considerably, being least in *1334*, where it is often less than half of the length, and broadest in *90*, where it may be as much as three-fourths of the length. The single flower-cluster in *90* seems to be lateral, but probably is terminal on a short concealed branch.

MERIANIA SPRUCEANA Cogn. Dept. San Martín, San Roque: *W 7010*.

GRAFFENRIEDA DC.

GRAFFENRIEDA LIMBATA Triana. Dept. Junín, Colonia Perene: *KS 24953;* Dept. San Martín, Tarapoto (type locality): *W 5893*.

GRAFFENRIEDA PATENS Triana. Dept. Loreto, near Iquitos: *K 413*.

GRAFFENRIEDA STENOPETALA Ule. This name has been applied to a well-marked species from Mount Roraima, resembling *G. intermedia* Triana in general habit but differentiated by its long, triangular, sharply acute sepals. Like that species, its flowers are 4-merous. *KS 24950* can not be distinguished from its specifically, differing only in some very small matters of dimensions, but has 5-merous flowers. This does not affect the validity of the species, but may throw some doubt on the value of the number of flower-parts in the classification of species in this genus. In comparison with the type, the recent collection has somewhat looser flower-clusters and less pubescent infloresence.

CALYPTRELLA Naud.

CALYPTRELLA CUCULLATA (Don) Triana. Dept. San Martín: *W 6459, 7109*.

CALYPTRELLA TRISTIS Triana. Dept. San Martín, Tarapoto (type locality): *W 5987*.

SALPINGA Mart.

SALPINGA SECUNDA Schr. & Mart. Dept. Loreto: *KS 27148, 27328, 27388, 29667, 29921, K 517*.

MONOLENA Triana

MONOLENA PRIMULAEFLORA Hook.f. Dept. Junín, Pichis Trail: *KS 26131, 26205.*

DIOLENA Naud.

DIOLENA AMAZONICA Pilger. Dept. Junín: *KS 25385, 26660, 26800;* Dept. Loreto: *KS 29502, 29568, W 1804, 3421.* This recently described species seem to be common in Amazonian Peru and we have it from altitudes up to 700 m.

LEANDRA Raddi

LEANDRA CHAETODON (DC.) Cogn. Dept. Junín, Pichis Trail: *KS 26211;* Dept. Loreto: *KS 26928, 26971, 28336, W 1328, 2687, 3762.*

LEANDRA DICHOTOMA (Don) Cogn. Dept. Junín: *KS 2367, 24803, 25301, 26081;* Dept. San Martín: *W 7186.*

LEANDRA FRANCAVILLANA Cogn. Dept. Junín: *KS 26223, 26557;* Dept. Loreto, *KS 27303, 28593, W 2555, 2686, 8238.* The first specimen cited is pubescent with red-purple hairs which give it a somewhat different aspect.

LEANDRA LONGICOMA Cogn. Dept. Loreto: *KS 27087, 27242, 28252, 28415, 28558, 29233, 29453, 29583, W 631, 704, 1693, 2327, 7838, K 1150.*

LEANDRA NERVOSA (Naud.) Cogn. Dept. Ayacucho, Ccarrapa: *KS 22370.*

LEANDRA RETROPILA Cogn. Dept. Ayacucho, Estrella: *KS 22672;* Dept. Junín, Pichis Trail: *KS 26134.*

LEANDRA REVERSA (DC.) Cogn. Dept. Junín, above San Ramón: *KS 24736.*

LEANDRA RUFESCENS (DC.) Cogn. Pará: *KS 30351, Dahlgren & Sella 484.*

LEANDRA SECUNDA (Don) Cogn. Dept. Loreto: *KS 27349, 28334, 28464, 28774, W 788, 797, 1260, 1291, 1670, 2080, 2207; K 1262.*

LEANDRA SOLENIFERA (Schr.) Cogn. Dept. Loreto, Pebas: *W 1905.*

PTEROCLADON Hook. f.

PTEROCLADON SPRUCEI Hook. f. Dept. San Martín, San Roque: *W 7050;* Dept. Junín, Pichis Trail: *KS 26102,* a teratological form with abortive flowers.

MICONIA R. & P.

§I. *Jucunda*

MICONIA HOLOSERICEA (L.) Triana. Dept. San Martín, Lamas: *W 6435;* Dept. Junín, San Ramón: *KS 24766, 24800.*

§II. *Tamonea*

MICONIA ACUMINIFERA Triana. Dept. Junín: *KS 24000, 25575, 25997, 26188*: Dept. San Martín: *W 7421*. Our specimens are conspecific with *Triana 3997* from Colombia, apparently the type of the species.

MICONIA AMAZONICA Triana. Dept. San Martín, Tarapoto: *W 6076;* Dept. Loreto: *KS 29193, W 4588*.

MICONIA AUREA (Don) Naud. Dept. Loreto: *W 7858*.

MICONIA BUBALINA (Don) Naud. Dept. Loreto: *KS 26924, 27216, 29856, W 3666, 3707*.

MICONIA DODECANDRA (Desr.) Cogn. Dept. Junín, near La Merced: *KS 23920*.

MICONIA DONAEANA Naud. Dept. San Martín, San Roque: *W 7002, 7055*.

Miconia flaccida sp. nov. §*Tamonea;* ramis acute 4-angulatis et anguste 4-alatis, ad nodos tenuiter furfuraceis ceterum glabris; foliis anguste ellipticis acuminatis integris ad petiolum gracilem longe cuneatis glabris 3-pli-nerviis; panicula ramosa axibus 4-alatis ad nodos tenuissime furfuracea; floribus sessilibus 5-meris; hypanthio anguste campanulato furfuraceo; sepalis late triangularibus acutis e sinubus rotundatis; petalis obovato-oblongis inaequaliter retusis extus furfuraceis; staminibus circa 15 isomorphis; filamentis glabris; antheris crasse subulatis connectivo non producto; ovario 5-loculare; stylo longe exserto stigmate capitato.

Shrub 2–3 m. high, the branches sharply 4-angled and narrowly winged, somewhat swollen and thinly furfuraceous at the nodes, otherwise glabrous; petioles slender, 2–3 cm. long, glabrous; blades thin, pale green, narrowly elliptic, 25–35 cm. long, 6–7 cm. wide, long-acuminate, entire, long-cuneate at base, glabrous throughout, 3-pli-nerved; primaries plane above, barely elevated beneath, the lateral about 3 mm. from the margin; secondaries plane on both sides, 8–12 mm. apart, ascending at an angle of about 75°; tertiaries obscure, reticulate; panicle 15 cm. long, widely branched, the axes sharply 4-angled, narrowly 4-winged, thinly furfuraceous at the nodes; flowers in terminal clusters of 3, the central sessile, the lateral sessile or very short-pedicelled, 5-merous; hypanthium tubular-campanulate, 2.7 mm. long to the torus, very minutely and sparsely pulverulent; calyx-tube erect, prolonged 0.8 mm.; sepals broadly triangular from rounded sinuses, 0.4 mm. long, acute, the exterior teeth reduced to minute subapical thickenings, pulverulent like the hypanthium; petals obovate-oblong, 4 mm. long, 2.3 mm. wide, strongly inequilateral and conspicuously retuse, minutely but densely furfuraceous externally; stamens variable in number, about 15, isomorphic; filaments 4 mm. long, slightly flattened, glabrous; anthers stoutly subulate, nearly straight, 3 mm. long, the slender connective neither appendaged nor prolonged; ovary

half-inferior, 5-celled, its rounded summit glabrous; style straight, glabrous, slender, 7 mm. long; stigma capitate, 1.2 mm. in diameter.

Type, *KS 25625*, collected in dense forest on the Pichis Trail, Dept. Junín, Peru, alt. 1600–1900 m. The species is remarkable in several ways: its square winged stems are hollow, and in one place have been punctured at a swollen node by some insect, suggesting a possible myrmecophily; the general aspect of its inflorescence is unusual, its numerous stamens resemble those of §*Tamonea* more closely than any other section of the genus, but suggest those of *Tococa*. There is no species known to me with which it may well be compared or to which it seems to be related; under the arrangement of species in Cogniaux' Monograph it should find a place near *M. reducens* Triana.

MICONIA GLANDULIFERA Cogn. Dept. Junín, Pichis Trail: *KS 25451*, near Perene Bridge: *KS 25373;* Dept. Loreto: *KS 28153, W 4100.*

MICONIA MACROPHYLLA (Don) Triana. Dept. Junín, near Perene Bridge: *KS 25297;* Dept. San Martín, San Roque: *W 7793;* in the lowlands of Dept Loreto: *KS 27094, 27507, 28561, 29157, 29531, W 1481, 1646, 1996, 2770, 4569.*

MICONIA PARVIFLORA (Benth.) Cogn. Dept. Loreto: *W 901;* Manáos: *KS 30010, 30142.*

MICONIA TRAILLII Cogn. *W 1629* and *1631*, from Dept. Loreto, are fruiting specimens in which the form of the hypanthium strongly indicates the section *Tamonea*. They have been compared with Traill's type of the species at Kew, which they resemble considerably in foliage, and are referred here tentatively.

§III. *Adenodesma*

MICONIA AMPLEXANS (Crueg.) Cogn. *Pogonorhynchus amplexans* Crueg. (1847; Trinidad), *Miconia umbrifera* Naud. (1851; Peru), *Miconia symplectocaulos* Pilger (1905; Amazonas). The early descriptions given by Crueger and Naudin are so clear that there is no doubt of their application, but it has been necessary to decide whether the Ule plant upon which Pilger based his species differs specifically. Existing material of the type of *P. amplexans* is apparently to be found only at Kew and is not in good condition. Nevertheless, careful examination has convinced me that it is conspecific with the plants from Loreto and Amazonas, as well as with others from farther south in Bolivia. The Berlin herbarium contains five different collections of Tessmann and Ule which have been referred to *M. symplectocaulos*, and all of them would have been placed in *M. amplexans* by anyone using Cogniaux' Monograph as a guide. The same herbarium contains but

a single specimen under *M. amplexans*, *Poeppig 1424*, which is actually *M. amplexicaulis* Naud. One can imagine that Pilger, consulting the herbarium to confirm his identification of Ule's plant and finding this sheet only, saw at once that he was dealing with something entirely different, described his new species, and compared it with *M. tomentosa* (Rich.) Don, to which it is of course related.

The geographic distribution of *M. amplexans* is peculiar. Cogniaux mentions it from Peru, Panama, and Trinidad, and it is still unknown from any intermediate stations in this rather large triangle. It extends south into Bolivia, whence it is represented by *Rusby 2251* and *Williams 780*, both distributed as *M. tomentosa*, and by *Buchtien 1736*, distributed as *M. amplexicaulis*. More recently it has been discovered in British Honduras, *Schipp 58*, where it becomes a tree 8 m. high.

In Amazonian Peru and adjacent Brazil it is one of the commonest species, but apparently does not extend west beyond the Department of Loreto. Our specimens include *KS 26917, 26933, 28052, W 677, 1473, 1577, 1633, 1698, 2049, 4259, K 88, 288*, and *1419*. This ample series is in general quite uniform, but a few need comment. In *K 88* the uppermost leaves are narrowly cuneate at base and not amplexicaul, while the lower leaves are typical; the veins are very slightly impressed. In *W 1577* the leaves are narrowly cuneate and distinctly petiolate, but the auricles are rounded; here also the veins are somewhat impressed. These two plants therefore approach *M. tomentosa*. In *W 1473, K 1419*, and *KS 26917* the pubescence of the lower leaf-surface is much softer and denser and composed of much larger stellate hairs.

§IV. *Octomeris*

MICONIA MURICATA (Don) Triana. Pozuzo: *Macbride 4573;* Dept. Junín, La Merced: *KS 23526, 24085*.

§V. *Laceraria*

MICONIA AUREOIDES Cogn. *KS 29528*, with calyx closed in bud, is referred here tentatively.

§VI. *Eumiconia*

MICONIA ALATA (Aubl.) DC. Manáos: *KS 30004;* Pará: *KS 30363*.

MICONIA ALBICANS (Sw.) Triana. Although a common lowland species in other parts of South America, we have it in recent collections only from altitudes of 600 m. or more. Dept. Junín, La Merced: *Macbride 5520*, San Ramón: *KS 24777;* Dept. Huanuco, Pampayacu: *Macbride 5103;* Dept. San Martín, San Roque: *W 7437, 7649*.

MICONIA AMPLEXICAULIS Naud. Dept. San Martín, San Roque: *W 7005.*

MICONIA AULOCALYX Mart. Dept. Loreto: *KS 27406, 29255, W 487, 5282.*

MICONIA BARBINERVIS (Benth.) Triana. Dept. Loreto: *KS 28071, W 1795, K 927;* Terr. Caquetá, Colombia: *Woronow & Juzepczuk 5994, Juzepczuk 6024.*

MICONIA CALVESCENS DC. Very common in the lowlands of Peru and down the Amazon to its mouth. Dept. Junín: *KS 25028, 26258, 26276, 26321, 26472, 26528, 26684;* Dept. Loreto: *KS 27396, 29560, 29688, W 297, 1479, 2116, 2457, 2876, 3314, 3367, K 1428;* Pará: *Dahlgren & Sella 125.*

MICONIA CANNABINA Markg. The type locality of the species is Iquitos and it seems to be abundant in the vicinity: *KS 27013, 27223, 29738, W 1493, 3663, 8154, K 1076.*

MICONIA CAPITATA Ule. Dept. Loreto, apparently common: *KS 27284, 28437, 29664, W 1327, 1338, 1634, 2993.*

MICONIA CERAMICARPA (DC.) Cogn. Near Pará: *Williams & Sella 45, KS 30309.* Although very common in the lowland forests near the coast, it does not extend far up the Amazon, where its place is taken by the related *M. nervosa.*

MICONIA CHAMISSOIS Naud. Dept. Loreto: *W 7982, KS 26902, 27178, K 339.*

Miconia clavistila sp. nov. §*Eumiconia Glomeratiflorae;* ramis, petiolis, inflorescentia, et hypanthio dense brunneo-tomentosis, pilis stipitato-stellatis; petiolis brevibus crassis; foliorum laminis late oblongis acutis basi rotundatis vel obscure subcordatis subintegris 3-nerviis, supra glabris praeter venam mediam tomentosam, subtus molliter stellato-pubescentibus; panicula sparse ramosa, ramis elongatis glomerulos terminales gerentibus; floribus 5-meris sessilibus; hypanthio parvo campanulato; calycis tubo longe producto; sepalis ovatis obtusis; petalis obovatis acutis inaequilateralibus; staminibus isomorphis; filamentis filiformibus; antheris linearibus, connectivo basi in lobos 2 breves laterales producto; ovario 3-loculare; stylo elongato, post anthesin superne incrassato.

Stems stout, densely tomentose above with brown, stalked, stellate hairs, the same indument covering the petioles, inflorescence, and hypanthium; petioles stout, 10–15 mm. long; blades oblong or somewhat obovate-oblong, firm, as much as 16 cm. long by half as wide, obscurely acuminate to an acute apex, very shallowly and irregularly crenate-serrate, rounded or slightly subcordate at base, 3-nerved; upper surface minutely stellate-tomentose along the midvein, otherwise opaque and glabrous; lower surface softly pubescent,

especially on the primaries, with brown, short-stalked, stellate hairs; primaries lightly impressed above, prominent beneath; secondaries nearly straight, 4–7 mm. apart, ascending at an angle of about 70°, obscure and plane above, barely elevated beneath; inflorescence a widely branching panicle about 10 cm. long and wide, the opposite branches elongate, simple or once branched, each branch bearing a single dense terminal glomerule of sessile 5-merous flowers; hypanthium fleshy, campanulate, 2.7 mm. long; calyx-tube prolonged 0.8 mm. to rounded sinuses; sepals broadly ovate-triangular, 1.2–1.3 mm. long, obtuse, erect; exterior teeth almost wholly adnate, stoutly triangular, the free tip 0.2 mm. long, conspicuously surpassed by the sepals; petals obliquely obovate, 4.8 mm. long, 2.2 mm. wide, sharply acute and strongly inequilateral, completely but minutely stellate-pubescent without; stamens isomorphic; filaments filiform, 5 mm. long; anthers linear, 4.5 mm. long, opening by a minute terminal pore; connective 2-lobed at base and curved anteriorly into 2 lateral, scarcely diverging lobes; ovary half-inferior, 3-celled, its rounded summit densely but minutely pubescent around the style-base; style straight and slender, 8 mm. long, glabrous, in age becoming conspicuously thickened distally; stigma truncate, 0.7 mm. in diameter.

Type, *W 373*, collected on the lower Río Nanay, Dept. Loreto, Peru. According to the arrangement of species by Cogniaux, it appears to be related to *M. barbinervis* (Benth.) Triana and *M. stelligera* Cogn., particularly the latter, but differs from both in leaf-form and elongated style.

Miconia compacta sp. nov. §*Eumiconia Glomeratiflorae*; ramis teretibus dense brunneo-stellato-tomentosis; petiolis crassis brevibus dense tomentosis; laminis membranaceis ellipticis acutis vel abrupte acuminatis integris basi rotundatis 3-nerviis vel 3–5-pli-nerviis, supra ad venas primarias sparse tomentosis ceterum glabris, subtus dense stellato-pubescentibus; panicula racemiforme contracta confertiflora tomentosa, ramis lateralibus brevissimis, bracteis persistentibus; floribus 6-meris in glomerulis terminalibus sessilibus; hypanthio campanulato stellato-tomentoso; sepalis reflexis ovatis obtusis e sinubus angustis; petalis anguste obovatis basi cuneatis; filamentis anguste clavatis glandulosis; antheris linearibus dimorphis, connectivo majorum dorso tuberculato, basi breviter producto glandulosoque, minorum breviter producto ad basin glanduloso; ovario 3-loculare glanduloso; stylo glabro, stigmate ovoideo.

Stems woody, 1–4 m. high, the upper branches terete, densely stellate-tomentose with brown hairs; petioles stout, 8–17 mm. long, tomentose like the stem; blades elliptic, 9–17 cm. long by half as wide, acute or abruptly acuminate, entire, rounded at base, normally 3-nerved, but in a few leaves distinctly 3–5-pli-nerved, glabrous above except a small strip of stellate tomentum along the primaries, freely but loosely stellate-pubescent below, more densely on the veins; principal veins nearly plane above, elevated beneath, the secondaries 5–8 mm. apart, ascending at an angle of 70°, the tertiaries

reticulate beneath; panicles contracted, 5–8 cm. long, densely stellate-tomentose, the lateral branches 3–5 mm. long; bracts lanceolate, persistent, 2–3 mm. long, densely tomentose; flowers sessile in small terminal glomerules, 6-merous; hypanthium campanulate, 3.2 mm. long to the torus, loosely but continuously tomentose with sessile, cinereous, stellate hairs; calyx-tube not prolonged; sepals reflexed, broadly ovate, 1.3 mm. long, 1 mm. wide, obtuse, pubescent like the hypanthium but less densely, the sinuses very narrow; exterior teeth reduced to minute subapical protuberances; petals narrowly obovate-spatulate, 4 mm. long, 1.8 mm. wide, cuneate at base, rounded above, glabrous, the margins and apex somewhat involute and cucullate; stamens dimorphic; large stamens: filaments flattened, narrowly spatulate, 3.2 mm. long, freely glandular except on the back; anthers nearly straight, linear, 3.6 mm. long, the connective much thickened below the middle, with a small dorsal protuberance, prolonged 0.4 mm. below the pollen-sacs into a fleshy, freely glandular base; small stamens: filaments 2.7 mm. long, very narrowly spatulate and sparsely glandular; anthers arcuate, 2.8 mm. long, the connective much thickened basally and prolonged 0.3 mm., sparsely glandular at the very base only; ovary half-inferior, 3-celled with numerous ovules, the free summit truncate-conic, minutely glandular-punctate; style stout, glabrous, at least 4 mm. long; stigma large, ovoid.

Type, *KS 26936*, collected in forest at Iquitos, Dept. Loreto, Peru, alt. about 100 m.; other specimens from the same place are *KS 27354* and *K 1050*. The same species was also collected at Iquitos by Tessmann, numbers *3648* and *3612*. *M. compacta* appears to be related to *M. glomerata* Triana, to which the Tessmann collections have been referred at Berlin. That species has much narrower leaves truncate or cordate at base, 5-merous flowers, and very short, broadly rounded sepals.

MICONIA DIPSACEA Naud. Dept. Ayacucho: *KS 22411;* Dept. Junín, La Merced: *KS 23505*, *Macbride 5541*, Huacapistana: *KS 24516*.

MICONIA ERIOCALYX Cogn. A tree 8–10 m. high, Dept. Loreto, Yurimaguas: *KS 27593*.

MICONIA ERIOCLADA Triana. Common at altitudes of less than 700 m., Dept. Junín: *Macbride 5546*, *KS 23469*, *25070*, *25221*, *25372*, *26469;* Dept. San Martín: *W 6758;* Dept. Loreto: *KS 27835*, *29504*, *29554*, *W 294*, *3210*, *4940*, *4999*.

MICONIA EUGENIOIDES Triana. Dept. Loreto, La Victoria: *W 2966*, without flowers. The specimen has narrower leaves than the type and is referred here with considerable reluctance.

MICONIA FALLAX DC. Dept. Junín, San Ramón: *KS 24775*, an aberrant form with longer leaves.

MICONIA HETEROMERA Naud. Dept. Loreto: *W 2688*, *2985*, *3011*. Our specimens, which are totally glabrous on the leaves and only thinly fur-

furaceous on the petioles and stem, are referred tentatively to this species, which is described as setulose on the leaves and hirsute on the petioles. This may be due to the age of the specimens, ours being fully mature, or to geographic differentiation, ours being from the lowlands near Iquitos, while the original is from Maynas Alto. The similarity of leaf-shape is striking.

MICONIA IBAGUENSIS (Bonpl.) Triana. Dept. Junín: *Macbride 5534, 5488, KS 24781;* Dept. Huanuco: *Macbride 5020;* Dept. San Martin: *W 5380, 5630, 6151, 6428, 7530.*

MICONIA JURUENSIS Pilger. Dept. Loreto, lower Río Nanay: *W 481.* The specimen agrees excellently with the type, *Ule 5827*, in the Berlin herbarium.

MICONIA LEPIDOTA DC. Dept. Loreto: *KS 29954, W 4036;* Manáos: *KS 30123;* Pará: *KS 30495.*

Miconia longiracemosa sp. nov. § *Eumiconia Paniculares;* ramis glabris, internodis complanatis mox subteretibus; foliis anguste ellipticis, breviter acuminatis, subintegris, basi in petiolum brevem alatum cuneatis, 3-plinerviis, utrinque glabris, subtus angustissime reticulatis; pedunculis compressis, paniculae ramis lateralibus multo elongatis; floribus 5-meris, sessilibus aut brevissime pedicellatis; hypanthio tubuloso-campanulato, minutissime rubropunctato; sepalis erectis, triangularibus, acutis, dentibus exterioribus subulatis quam sepalis brevioribus; petalis obovato-oblongis; antheris linearibus dimorphis, connectivo exteriorum basi in appendicem latam rotundatam, interiorum in calcar dorsale breve et lobos 2 laterales deflexos producto; ovario 4-loculare.

Stems woody, apparently sparsely branched, glabrous, the upper internodes conspicuously compressed, later filling out to roundly 4-angular and eventually subterete; leaf-blades firm, narrowly elliptic, 12–25 cm. long by a third as wide, abruptly acuminate, nearly or quite entire, cuneate at base into a winged petiole 15–20 mm. long, 3-pli-nerved, glabrous; primaries and secondaries impressed above, elevated beneath, the latter 5–8 mm. apart, ascending at an angle of about 70°, tertiaries obsolete above, very finely reticulate beneath; panicles large and freely branched, 15–20 cm. long, glabrous, the internodes conspicuously flattened, the lateral branches greatly elongate; flowers 5-merous, mostly in glomerules of 2, of which one is sessile and the other short-pedicelled; hypanthium tubular-campanulate, 2.4 mm. long to the torus, obscurely 10-ribbed, minutely verruculose and sparsely furfuraceous with reddish, probably substellate hairs; calyx-tube somewhat flaring, prolonged about 0.4 mm., sepals erect, triangular, acute, 0.5 mm. long, exterior teeth subulate, shorter than the sepals; petals obovate-oblong, 1.5 mm. long by 1.1 mm. wide, slightly inequilateral, obscurely retuse, thinly pulverulent externally; anthers stoutly linear, opening by a minute terminal pore, dimorphic; connective of the larger prolonged 0.4 mm. at base into a single semicircular

flat organ, that of the smaller prolonged 0.2 mm. into a triangular dorsal and 2 broadly triangular, deflexed lateral lobes; ovary half-inferior, 4-celled, its free summit glabrous, truncate-conic, sharply 10-ribbed and minutely 10-toothed.

Type, *W 4249*, collected on the lower Río Huallaga, Dept. Loreto, Peru, alt. 155–210 m.; other specimens from the same region, or from the Río Itaya and Río Nanay, are *W 115*, *604*, *3296*, *3878*, *4038*, *4167*, and *4349*.

Superficially this species bears a strong resemblance to *M. pteropoda* Benth., which grows in the same region and with which it was at first confused, until the arrival of the later numbers provided flowering material for more exact comparison. The stamens of *M. pteropoda* are isomorphic and the connective is divided at base into two lateral lobes which are strongly deflexed anteriorly. Even in sterile condition the two may be distinguished by the venation. In *M. pteropoda* the vein-areoles on the lower side of the leaf are usually more or less oblong and always exceeding 1 mm. in their smallest dimension; in *M. longiracemosa* they are nearly always 5–6-sided and only 0.3 mm. across.

At the present time the value of the anther-connective in the classification of *Miconia* is not fully known. Whether these two species should be regarded as related because of their superficial similarity, or separated because of their differences in anthers, must wait until the whole genus is more thoroughly studied.

Miconia Martiniana sp. nov. §*Eumiconia;* ramis juvenilibus compressis bisulcatis densissime brunneo-furfuraceo-tomentosis; petiolis brevissimis crassis dense tomentosis; foliorum laminis magnis anguste obovato-oblongis satis acuminatis leviter undulato-serratis e media ad basin subcordatam angustatis 5-pli-nerviis, supra primum stellato-pubescentibus mox glabris nitentibus ad venam mediam tomentosis, subtus molliter stellato-pubescentibus praecipue ad venas; inflorescentia subsimplice ramis paucis elongatis stellato-tomentosis; floribus 5-meris sessilibus secus ramos inflorescentiae in glomerulos dense confertis; hypanthio campanulato tomentoso; sepalis brevissimis triangularibus e sinubus rotundatis, dentibus exterioribus nullis; petalis parvis cuneatis inaequilateralibus retusis extus stellatis; filamentis gracilibus; antheris dimorphis linearibus poro minuto dehiscentibus, connectivo ad basin dilatato et (ser. ext.) in lobos 2 tortos laterales et 2 dorsales minutos vel (ser. int.) in lobos 2 laterales graciles et 1 dorsalem producto; ovario semi-infero, 3-loculare, summo conico pubescente in lobos 5 erectos producto; stylo glabro; stigmate capitato.

Upper internodes alternately flattened, shallowly 2-sulcate, very densely furfuraceous-tomentose; petioles stout, 3–5 mm. long, tomentose like the

stem; leaf-blades firm, narrowly obovate-oblong, as much as 9 by 26 cm., rather abruptly acuminate, inconspicuously undulate-serrulate, narrowed from above the middle to a cordate base, 5-pli-nerved, the upper side at first stellate-pubescent, soon becoming glabrous and shining, but persistently tomentose on the midvein, the lower side brown, densely and softly stellate-pubescent, especially on the veins; primaries and secondaries impressed above, strongly elevated beneath, the latter 7–9 mm. apart, ascending at an angle of about 75° and nearly straight, the tertiaries obsolete above, reticulate beneath; inflorescence densely stellate-tomentose, with a few straight, elongate, 4-sulcate branches bearing each several crowded glomerules of sessile 5-merous flowers; hypanthium narrowly campanulate, 2.8 mm. long, densely tomentose with pale brown stellate hairs; calyx-tube prolonged 0.8 mm. erect, pubescent like the hypanthium; sepals triangular, acute, 0.3 mm. long, from broadly rounded sinuses, pubescent like the hypanthium; exterior teeth not differentiated; petals cuneate, 2.7 mm. long, inequilateral, irregularly retuse, stellate-pubescent on the outside, mostly near the tip; stamens dimorphic; filaments slender, 3.5 or 3 mm. long; anthers linear, straight, 4.5 or 3 mm. long, opening by a minute terminal pore; connective expanded at base into (large anthers) 2 conspicuous, somewhat spiral lateral lobes and 2 minute dorsal lobes or (small anthers) 2 very slender lateral lobes and 1 minute dorsal lobe; ovary half-inferior, 3-celled, the conic summit minutely pubescent and prolonged into 5 erect flat lobes 0.6 mm. long; style glabrous, 7 mm. long; stigma capitate, 0.7 mm. in diameter.

Type *W 7212*, collected at San Roque, Dept. San Martín, Peru, alt. 1350–1500 m. The plant resembles in appearance and is related to *M. phanerostila* Pilger, which has much longer sepals, glandular connective, truncate stigma, and decurrent leaves.

MICONIA MATTHAEI Naud. Dept. Loreto, Masisea: *KS 26854*.

Miconia membranicalyx sp. nov. §*Eumiconia Glomeratiflorae;* ramis juvenilibus dense tomentosis mox glabrescentibus subteretibus; petiolis crassis brevibus dense tomentosis; laminis anguste ellipticis acuminatis integris basi obtusis 3-nerviis, supra ad basin venae mediae tomentosis ceterum glabris, subtus stellato-pubescentibus, venis lateralibus ad marginem proximis; inflorescentia parva dense tomentosa, ramis lateralibus circa 4; hypanthio campanulato dense stellato-tomentoso; sepalis erectis triangularibus membrano connatis, dentibus exterioribus triangularibus crassis sepala obtegentibus; petalis obovatis inaequilateralibus; antheris majoribus basi in appendicem crassam obliquam subcordatam productis, minoribus in appendicem dilatatam 5-lobatam expansis; ovario 5-loculare pauciovulato.

Stems woody, subterete, densely tomentose when young with dull brown, stellate hairs, glabrescent below; petioles very stout, 8–12 mm. long, tomentose like the stem; blades thin, narrowly elliptic, 11–16 cm. long, 3.5–5 cm.

wide, acuminate, obtuse at base, entire, glabrous above, except for a short line of tomentum along the base of the midvein, freely stellate-pubescent on the lower side, somewhat more densely on the veins, 3-nerved, the laterals only 2–3 mm. from the margin; primaries and secondaries impressed above, elevated beneath, the latter averaging 6 mm. apart, ascending at an angle of 70°, the tertiaries obsolete above, scarcely reticulate beneath; inflorescence about 3 cm. long, its stout axes densely tomentose, the lateral branches 3–4 mm. long and about 4 in number; flowers 5-merous, sessile in dense glomerules; hypanthium broadly campanulate, 2 mm. long to the torus, densely stellate-tomentose; calyx-tube prolonged 0.7 mm; sepals thin, glabrous, narrowly triangular, 0.4 mm. long, connected by a delicate membrane, completely concealed by the thick, broadly triangular, obtuse, densely tomentose exterior teeth; petals narrowly obovate, 4 mm. long by 2.4 mm. wide, very unsymmetrical; large stamens: filaments slender, 5 mm. long; anthers stoutly linear, 3.3 mm. long, the connective prolonged 0.8 mm. below the pollen-sacs and dilated into a fleshy, oblique, subrotund or broadly cordate appendage surrounding the filament; small stamens: filaments slender, 4.2 mm. long; anthers stoutly linear, 2.4 mm. long, the connective prolonged 0.7 mm. below the pollen-sacs, divided on the ventral side, and dilated into a triangular, 5-lobed appendage surrounding the filament; ovary 5-celled, with few ovules in each cell; style straight, slender, glabrous, 7 mm. long, the stigma barely expanded, 0.5 mm. in diameter.

Type, *Dahlgren & Sella 522*, collected at Pará, Brazil. *M. membranicalyx* is closely related to *M. multispicata* Naud., of the West Indies and Trinidad, and the undescribed *M. ruficalyx* Gleason, of British Guiana. All three agree in the general structure of the inflorescence, the membrane connecting the sepals, the dimorphic stamens with greatly prolonged connective, and the small number of ovules. Our species is separated from the other two by its narrower leaves, its much reduced inflorescence, its strongly inequilateral petals, and its 5-celled ovary.

MICONIA MOLLIS Triana. Dept. San Martín, Alto Río Huallaga: *W 6718*. This station is not far from the type locality at Tarapoto and the species was also collected in the same general region by Mathews. It is not well differentiated from *M. Schwackei* Cogn.

MICONIA NERVOSA (Sm.) Triana. Dept. Junín: *KS 26225, 26339, Macbride 5811;* Dept. San Martín: *W 6074;* Dept. Loreto: *KS 26855, 27576, 27937, 27967, 28560, 28745, 29665, W 685, 784, 801, 1598, 1869, 2043, 2321, 2581, 3083, 3728, 3729, 3879, 4344, 4700, 4801, 8231.*

Miconia nobilis sp. nov. §*Eumiconia Impetiolares;* ramis crassis, obtuse 4-angulatis, dense fusco-tomentosis; petiolis triquetris brevissimis; laminis maximis membranaceis obovatis acuminatis integris basi acutis 5-pli-nerviis supra glabris subtus ad venas sparse et ad paginam sparsissime breviterque

lanatis; panicula ampla ramosa lanata; floribus 5-meris in glomerulis paucifloris sessilibus; hypanthio campanulato tenuissime stellato; sepalis brevissimis late rotundatis; petalis obovato-oblongis; staminibus subdimorphis linearibus, connectivo infra thecis breviter producto at ad marginem glanduloso; ovario 3-loculare; stylo breve crasso glabro, stigmate capitato.

A tree 4–5 m. high, the stout upper branches roundly 4-angled and densely lanate or tomentose with brown hairs; petioles stout, 1 cm. long, 3-angled; blades thin, obovate, as much as 46 cm. long by half as wide, abruptly acuminate, entire, acute at base, 5-pli-nerved, the outer pair submarginal, veins plane above, the secondaries about 1 cm. apart, ascending at an angle of about 75°, primaries and secondaries prominently elevated beneath, the numerous tertiaries plane and finely reticulate; upper surface glabrous, the lower side very thinly and sparsely lanate with short appressed hairs, most abundant on the veins; panicle 20 cm. long, freely branched, its strongly sulcate branches densely brown-lanate; flowers 5-merous, sessile in small, few-flowered, lateral glomerules; hypanthium campanulate, 2.7 mm. long to the torus, very thinly and minutely stellate-pubescent, soon glabrous; calyx-tube prolonged 0.6 mm.; sepals depressed-rounded, 0.2 mm. long, from broadly rounded sinuses, the exterior teeth reduced to minute verrucosities; petals rather thick, obovate-oblong, 2.8 mm. long, 1.9 mm. wide; anthers somewhat dimorphic, linear, opening by a minute terminal pore, 3.3 or 2.8 mm. long; connective prolonged about 0.3 mm. below the thecae, that of the large anthers dilated into a single truncate lobe nearly surrounding the filament, with 4–7 sessile glands on the margin of each side, that of the small anthers divided dorsally into 2 rounded lateral lobes, each with 1–4 marginal glands; ovary 3-celled with numerous ovules; style (perhaps not fully expanded) stout, terete, glabrous, 2.7 mm. long, the capitate stigma 0.8 mm. in diameter.

Type *KS 26006*, collected in dense forest at San Nicolas, on the Pichis Trail, Dept. Junín, Peru, alt. 1100 m. The calyx was noted as rich pink, the corolla white. The species is related to a small group including such well-known forms as *M. dipsacea* Naud., *M. impetiolaris* (Sw.) Don, and *M. amplexicaulis* Naud.; to this group have recently been added *M. falcata* Cogn. and *M. phanerostila* Pilger. The closer affinity of our species to the last is shown by the striking similarity of the glandular anthers. Pilger's plant differs from *M. nobilis* in its much smaller, elliptic, long-petioled leaves, its tomentose hypanthium, and its large triangular sepals.

Miconia Poeppigii Triana. *M. congesta* Cogn. Dept. Loreto: *W 2900, 3340, 3698, 4147, 4373, 4548;* Bolivia, Mapiri: *Buchtien 1680* (type of *M. congesta*). A careful examination of Cogniaux' species fails to reveal any difference between it and the Peruvian plants.

Miconia prasina (Sw.) DC. Dept. Loreto: *KS 27391, 28929, W 572, 974, 2936, 4807.*

MICONIA PTEROPODA Benth. Dept. Loreto: *W 1636, 2707, 2987;* near Pará: *KS 30462.*

MICONIA RADULAEFOLIA Naud. Dept. Loreto: *KS 27307, 29662.*

MICONIA RIPARIA Triana. Dept. Loreto, Río Maranon Valley: *KS 29136.* It is doubtful if *M. persicariaefolia* Cogn. can be kept separate.

MICONIA RUFESCENS (Aubl.) DC. Dept. San Martín, Tarapoto: *W 5422.*

MICONIA SCORPIOIDES (Schl. & Cham.) Naud. Dept. Loreto, Lower Río Huallaga: *W 4266, 4607.*

MICONIA SERIALIS DC. Dept. Loreto: *KS 27544, 27948, 28077, 29857, 29995, W 1454, 1508, 3631, 3836, 4718, K 36.*

MICONIA SPENNEROSTACHYA Naud. *M. Aspiazui* Macbr., *M. nectaria* Macbr. Dept. Loreto, a small tree at Pebas: *W 1686,* a shrub between Yurimaguas and Balsapuerto: *KS 28131.* The most conspicuous external feature of the species is a series of cyathiform glands along the upper part of the petiole or the base of the blade, while dissection shows that the anthers are glandular at base. It was also collected in Peru by Mathews (type) and Pearce, and extends south into Bolivia: *Rusby 2268, 2278, Steinbach 7173.* The latter has been elsewhere identified as *M. coronata* (Bonpl.) DC., which is quite a different plant, of the section *Tamonea,* growing in the Andes of Colombia. I can not distinguish Macbride's plants from this species.

MICONIA STENOSTACHYA DC. Dept. Ayacucho: *KS 22705;* Dept. San Martín: *W 5423, 5629, 5678, 6330, 6419, 6427.*

Miconia tetrasperma sp. nov. §*Eumiconia Paniculares;* ramis gracilibus arcte furfuraceis; petiolis brevibus furfuraceis; foliorum laminis ellipticooblongis utrinque acutatis integris 5-nerviis, supra glabra nitidula, subtus opacis brunneis tenuissime stellatis praecipue ad nervos; panicula sessile folia terminalia subaequante, ramis angulatis tenuiter stellatis; floribus sessilibus 5-meris; hypanthio late campanulato parvo stellato; calyce in alabastro fere clauso, ad anthesin in lobos 2–4 late triangulares lacero et mox deciduo; petalis anguste ellipticis acutis reflexis; staminibus dimorphis; filamentis gracilibus; antheris linearibus poro terminale dehiscentibus; connectivo infra thecis productis in lobum unicum dorsalem et lobos 2 latero-ventrales; ovario 4-loculare; ovulo 1 in quoque loculo; stylo elongato, stigmate truncato; baccis 4-spermis, seminibus magnis.

A shrub or small tree, the younger branches somewhat flattened, slightly swollen at the nodes, and very closely and minutely brown-furfuraceous; petioles angular, 8–12 mm. long, pubescent like the stem; leaf-blades rather firm, elliptic-oblong, those of the flowering branches as much as 12 by 5 cm., acuminate to an obtuse apex, entire, broadly acute at base, 5-nerved, the outer

pair submarginal, glabrous and somewhat shining above when mature, very sparsely stellate when young, minutely and sparsely stellate beneath, especially on the veins; panicle sessile, freely branched, 6–10 cm. long, its branches obscurely 4-angled, uniformly and thinly stellate; apparent pedicels up to 1.5 mm. long, minutely bibracteolate at the summit, the actual pedicels 0–0.3 mm. long; hypanthium broadly campanulate, stellate like the pedicels, 1.1–1.3 mm. long to the torus; calyx continuous and almost closed in bud, split at anthesis into 2–4 broadly triangular lobes extending nearly or quite to the torus, the lobes irregular in width, about 0.8 mm. long, acute to obtuse, soon deciduous; petals narrowly elliptic, subacute, reflexed at anthesis, 2.3 mm. long, minutely furfuraceous distally; stamens dimorphic; filaments very slender, 2 or 2.5 mm. long; anthers stoutly linear, 1.6 or 2 mm. long, opening by a small terminal pore, the basal two fifths sterile; connective prolonged below the thecae and dilated at base into (small stamens) a slender dorsal and two stouter lateral lobes or (large stamens) an oblique, flat, triangular organ with the dorsal lobe prominently spreading; ovary half-inferior, 4-celled, with a single ovule in each cell, free summit rounded, glabrous; style glabrous, slender, 3 mm. long; stigma truncate or punctiform.

Type *W 3757*, collected at Iquitos, Dept. Loreto, Peru. Other specimens are *K 265*, with stamens a trifle larger and at least some of the flowers 6-merous; *W 1520*, in fruit, the berries spherical, 4-seeded, each seed 3.2 mm. long; *W 2753, 3693*, still in bud, but agreeing with the type in all respects. All of these are from the immediate vicinity of Iquitos.

In searching for other species with which *M. tetrasperma* may be compared, one is led to *M. eugenioides* Triana. This little known species is represented in herbaria only by the type collection, *Spruce 3531*, from the Río Casiquiare. In general habit, it is very much like our species, and this similarity extends to the details of pubescence and floral structure with such remarkable fidelity that I have hesitated long before describing ours as new. The differences between the two species are as follows: All flower parts in *M. eugenioides* are a third to a half larger than in *M. tetrasperma*, except the petals, which are 70–90% larger; the calyx seems to split into 5 perfectly uniform sepals; there are about 10 ovules in each cell of the ovary, the leaves are shorter, proportionately narrower, acuminate to a sharper point, and sub-3-pli-nerved.

MICONIA STELLIGERA Cogn. Dept. Junín: *KS 24635, 24689, 25721, 26483;* Dept. Loreto: *KS 27575, 27598, 28190, 28960, 29332, 29474, W 3281, 4398, 5093.*

MICONIA TILIAEFOLIA Naud. Dept. Junín, San Ramón: *KS 24792*, La Merced: *Macbride 5331.*

MICONIA TRIPLINERVIS R. &. P. Dept. Ayacucho: *KS 22908, 23090;*

Dept. Junín: *KS 23618, 24729, 25247;* Dept. San Martín: *W 6958;* Dept. Loreto: *KS 28805, W 4950, 5094, 5278, 5343.*

§VII. *Glossocentrum*

MICONIA CENTRODESMA Naud. Dept. Loreto, Manfinfa on the upper Río Nanay: *W 1127*, identified by foliage resemblances alone.

MICONIA EGENSIS Cogn. Dept. Loreto: *W 1637, 2703.*

Miconia icosandra sp. nov. § *Glossocentrum*, ubique fere glabra; ramis obtuse 4-angulatis crassis; petiolis gracilibus brevibus; foliorum laminis membranaceis anguste oblongis acuminatis integris basi acutis sub-5-pli-nerviis; panicula ampla ramosa; floribus 5-meris confertis, terminalibus sessilibus, alaribus brevissime pedicellatis; hypanthio hemisphaerico; sepalis late triangularibus acutis e sinubus rotundatis, dentibus exterioribus subobsoletis; petalis obovato-oblongis, oblique retusis, utrinque minute pulverulentis; staminibus circa 20 isomorphis; filamentis filiformibus glabris; antheris linearibus obtusis poro lato ventro-terminale dehiscentibus; connectivo basi breviter producto in lobum dorsalem oblongum et lobos 2 laterales late rotundatos; ovario 4-loculare infero summo truncato glabro, placentis fere basalibus in loculos radiatim productis, ad basin ovarii adnatis, ovulis in quoque loculo 10–13; stylo elongato; stigmate capitato.

Small tree, glabrous throughout; younger stems rather prominently flattened with internodes 2–4 cm. long; petioles slender, 15–25 mm. long; leaf-blades membranous, narrowly oblong, broadest somewhat above the middle, as much as 16 cm. long by a third as wide, acuminate to a slender cusp 1 cm. long, entire, acute at base, sub-5-pli-nerved, obscurely and minutely pulverulent on the lower surface; veins all lightly impressed and finely but obscurely reticulate above, conspicuously elevated beneath, the secondaries 4–6 mm. apart, ascending at an angle of about 80°; inflorescence paniculate, about 15 cm. long, with spreading branches; flowers 5-merous, crowded in small cymules, the terminal sessile, the lateral on very short pedicels; hypanthium hemispheric, glabrous, 2 mm. long to the torus; calyx-tube somewhat flaring, prolonged 0.3 mm. to rounded sinuses; sepals broadly triangular, acute, 0.4 mm. long, the exterior teeth reduced to scarcely apparent thickenings; petals obovate-oblong, 3 mm. long, 2.2 mm. wide, obliquely retuse, minutely pulverulent distally on both sides; stamens about 20, isomorphic; filaments filiform, slightly flattened, 2.8 mm. long; anthers broadly linear, 2-celled, 2.4–2.6 mm. long, opening by a broad terminal pore; connective expanded below and prolonged 0.6 mm. below the thecae into an oblong medio-dorsal lobe and 2 small, rounded, latero-ventral lobes; ovary wholly inferior, 4-celled, its top flat or slightly depressed; placentae nearly basal, extending radially into the loculi and adnate to the bottom of the ovary, each with 10–13 ovules on its upper side; style straight, erect or declined, 6 mm. long; stigma capitate, 0.7 mm. in diameter.

Type, *KS 25781*, collected at Eneñas, on the Pichis Trail, Dept. Junín, Peru, alt. 1600–1900 m. In almost every flower there are some sterile filaments. Including them, the number of stamens varies from 17 to 21, but in at least half of the flowers exactly 20 were counted. The arrangement of the placentae is most unusual. There are other species of the genus in which the ovules are reduced to one in each cell, located at the base of the ovary, but this seems to represent a mere shortening of the usual axial placenta. In this species, the placenta is actually adnate to the bottom of the ovary. Genera have been described on morphological grounds of less importance, and the difference in placentae between the three subfamilies of Melastomataceae is of the same general order as the difference between this and the ordinary structure of *Miconia*. I know of no other species in the genus with which it may well be compared, but its position seems to be in § *Glossocentrum*.

Miconia Klugii sp. nov. § *Glossocentrum;* ramis crassis, obtuse 4-angulatis, minutissime arcte lepidotis; petiolis elongatis lepidotis; foliis magnis ellipticis abrupte acuminatis integris basi acutis 3-pli-nerviis supra glabris subtus dense lepidotis; floribus paniculatis sessilibus 5-meris, inflorescentia lepidota; hypanthio campanulato lepidoto; sepalis minutis; petalis cuneato-obovatis; antheris linearibus poro lato dehiscentibus, connectivo basi in lobum rotundatum producto; ovario 3-loculare, stylo breve subclavato, stigmate truncato.

Stems stout, roundly 4-angled, very closely and minutely lepidote; petioles stout, strongly angled, 2–6 cm. long, lepidote like the stem; blades firm, elliptic, as much as 23 cm. long by half as wide, acuminate, entire, broadly acute at base, 3-pli-nerved, glabrous and shining above, densely covered beneath with a thick brown indument of lepidote hairs; primaries and secondaries strongly impressed above, elevated beneath, the latter 5–8 mm. apart, ascending at an angle of about 60°; inflorescence paniculate, freely branched, 20 cm. long, closely but thinly lepidote; flowers 5-merous, sessile and densely crowded on short lateral branches; hypanthium campanulate, 1.3 mm. long to the torus, where it is slightly constricted, densely brown-lepidote, its walls thick and fleshy; calyx-tube erect, 0.5 mm. long, lepidote like the hypanthium, the sepals reduced to minute points only 0.1 mm. long; petals cuneate-obovate, 1.8 mm. long, 1 mm. wide, obliquely truncate or slightly retuse, inequilateral; stamens isomorphic; filaments very slender, 2 mm. long; anthers linear, 1.8 mm. long, opening by a wide terminal pore; connective prolonged 0.3 mm. at base and dilated into a rounded, obscurely lobed appendage; ovary very small, half-inferior, 3-celled, its free summit rounded and glabrous; style 2.5 mm. long, gradually thickened upward and 0.4 mm. in diameter at the truncate stigma.

Type, *K 1141*, collected in forest at Mishuyacu, near Iquitos, Dept. Loreto, Peru, alt. 100 m.; it is described as a tree 10 m. high. Our species

stands quite isolated from other Peruvian members of the section *Glossocentrum* and is characterized among them by its conspicuous lepidote pubescence. It is apparently more closely related to *M. chartacea* Triana and other similar species of southern Brazil.

MICONIA LONGIFOLIA (Aubl.) DC. Dept. Loreto: *KS 28103, 29777, W 3280, 3402, 3506, 4769, 4912, 5350.*

MICONIA MARTIUSIANA DC. Dept. Loreto, Mishuyacu: *K 22, 1082, 1090.*

MICONIA MINUTIFLORA (Bonpl.) DC. Dept. Junín: *KS 24627, Schunke 422;* Dept. San Martín: *W 5628, 6425, 7103;* Dept. Loreto: *W 1616, K 736;* Pará: *Dahlgren & Sella 195, 481.*

MICONIA PILGERIANA Ule. This well marked species, originally collected on the Juruá River in Brazil, appears to be common in Amazonian Peru in Dept. Loreto: *KS 28389, W 1714, 1718, 1779, 2319, 3339, K 1350.* Its stamens are especially distinctive, the basal half or somewhat more being sterile and nearly terete, while the distal portion broadens out into obovate fertile pollen-sacs opening by a wide terminal pore. In this feature it is extraordinarily like *M. stellipilis* Cogn., from Bolivia, the type of which is at the New York Botanical Garden. In fact, the stamens of the two species are indistinguishable in form or dimensions and the distinction lies in the shape of the petals and the character and amount of pubescence on the stem and leaves. Both Cogniaux and Ule placed their species in the section *Cremanium.* The former evidently mistook the sterile anther-base for a connective, since he reported the anthers as about 0.5 mm. long; the latter says the anthers are cuneate, 2-pored and glabrous, although I failed personally to find any anthers visible on the type specimen at Berlin, which seems to be entirely in fruit. In both species the filaments are but slightly flattened, quite slender, and with no trace of the geniculation which is so characteristic of most species of *Cremanium.* The anther taken as a whole is certainly linear and I believe both species properly belong in section *Glossocentrum.*

MICONIA PUBERULA Cogn. Dept. Junín: *KS 24790;* Dept. San Martín: *W 5702, 6150,*

MICONIA TERNATIFOLIA Triana. Dept. Ayacucho: *KS 22419, 22946;* Dept. Junín: *Macbride 5344, KS 24156;* Dept. San Martín: *W 6393, 7054, 7222, 7676.*

§VIII. *Chaenanthera*

MICONIA CHRYSOPHYLLA (Rich.) Urban. Dept. Loreto: *KS 27032, 27530, W 3660, 4809.*

MICONIA DICHROPHYLLA Macbr. Dept. Junín: *KS 26379, Macbride*

5495 (duplicate of the type); Dept. San Martín; *W 5891, 6421, 6472, 6586;* Dept. Loreto: *W 4886;* Bolivia, *Williams 757* (det. by Cogniaux as *M. fulva* DC.), *Buchtien 1711* (doubtfully det. by Cogniaux as *M. chartacea* Triana), *Bang 2650* (doubtfully det. by Cogniaux as *M. elaeagnoides* Cogn.). Of this whole series, only the last is in flower, the remainder exhibiting fruits or immature buds. An examination of the stamens in this one shows that they are stoutly linear, opening by a fairly wide terminal pore, the connective briefly prolonged at base and bearing two dorsal and two latero-ventral spurs; the calyx is essentially truncate, the sepals reduced to 5 minute teeth only 0.2 mm. long. The habit of the plant is so much like *M. chrysophylla* (Rich.) Urb. (*M. fulva* DC.) that a place for the species in section *Chaenanthera* is at once suggested, to which *M. elaeagnoides* also belongs. The former species has 3-nerved leaves, while in ours they are 5-pli-nerved, in which they agree with the description of *M. elaeagnoides.* A careful study of the original description of this species shows that our plants agree with it in all save two characters. The size of the leaves is stated as 20–30 cm. long by a third as wide; on our plants a few leaves can be found with this proportion, but not of this size, the largest being somewhat less than 20 cm. The sepals are described as linear-subulate, while ours are extremely short and triangular. But it also appears that Cogniaux never saw the stamens, which he says are unknown, so that he must have guessed at the section to which it belongs, and must also have had to estimate the shape of the sepals in flower from their appearance in fruit. Three European herbaria have given no help in the matter, there being no specimens of *M. elaeagnoides* at Berlin or Kew, while the single sheet so labeled at Geneva is *Poeppig 2458* instead of *2558* and of quite a different species.

In summary, I believe that Macbride's species is nothing more than the poorly known *M. elaeagnoides* Cogn., but pending examination of authentic material his name will be continued for our specimens. If this belief is correct, the species will need to be transferred from section VIII to *Eumiconia Seriatiflorae.*

MICONIA DOLICHORRHYNCHA Naud. Dept. Junín, La Merced: *Macbride 5589* (typical), Pichis Trail: *KS 25889* (terminal acumen poorly developed).

MICONIA REGELII Cogn. *KS 30012* and *30107*, from Mánaos, seem to agree fairly well with this species.

§IX. *Amblyarrhena*

MICONIA CILIATA (Rich.)DC. Pará: *KS 30279, Dahlgren & Sella 222, 254.*

MICONIA CRASSIFOLIA Triana. Chachapoyas: *W 7555*.

Miconia lasiostyla sp. nov. §*Amblyarrhena;* ramis obtuse tetragonis sulcatis pilis ramosis ferrugineis dense obtectis; foliis membranaceis breviter petiolatis obovato-oblongis amplis acutis ex medio ad basin obtusam cuneatis 5–7-pli-nerviis supra ad venas primarias stellatis ceterum glabris subtus dense stellato-pubescentibus; paniculis amplis ramosis dense stellato-tomentosis, floribus 5-meris subsessilibus ad apicem ramulorum glomeratis; hypanthio mediocro globoso-campanulato dense cinereo-stellato-pubescente; sepalis late rotundatis, dentibus exterioribus crasse conicis; petalis subrotundis; filamentis glandulosis inferne complanatis superne teretibus; antheris oblongis obtusis, connectivo non producto; ovario 4-loculare multiovulato summo glanduloso; stylo dense glanduloso, stigmate peltato.

Young stems obtusely 4-angled and lightly 4-sulcate, densely covered with brown branched hairs, becoming subterete and glabrous with age; petioles stout, 1–2 cm. long, pubescent like the stem; blades thin, obovate-oblong, as much as 20 cm. long by 7.5 cm. wide, acute, entire, narrowed from above the middle to an obtuse base, 5–7-pli-nerved; primaries plane above, elevated beneath, the upper arising 2–3 cm. above the base; secondaries obscure above, nearly plane beneath, arising at an angle of about 70°, about 3 mm. apart; tertiaries obsolete above, finely reticulate but nearly concealed beneath; upper surface glabrous, the primaries marked with a narrow line of short stellate hairs; lower surface densely brown-stellate-pubescent, the hairs longer and more crowded on the primaries; panicles ample, 10–15 cm. long, with usually 3 branches from the uppermost axils, the axes densely stellate-tomentose; flowers 5-merous, subsessile, densely crowded in terminal glomerules; hypanthium globose-campanulate or somewhat urceolate, 4 mm. long, densely cinereous-stellate with sessile many-branched hairs 0.3 mm. long; calyx-tube prolonged 0.3 mm.; sepals semicircular or somewhat oblong or ovate, 0.7 mm. long, 1.2 mm. wide, from narrow but rounded sinuses, membranous, nearly or quite glabrous; exterior teeth stout, conic, 0.4 mm. long, arising just above the level of the sinuses, pubescent like the hypanthium; petals subrotund, 2.5 mm. long and nearly as wide, somewhat retuse; stamens isomorphic; filaments 3 mm. long the lower four fifths stoutly flattened, the upper fifth terete and incurved, pubescent throughout, but chiefly on the basal portion, with glandular hairs 0.2 mm. long; anthers stout, oblong, 2–2.1 mm. long, with 4 cells in a single row, opening by a minute pore just under the end of the connective, which is neither prolonged nor lobed at base; ovary 4-celled. many-ovuled, its free summit convex and sparsely glandular around the style-base; style densely glandular, about 5 mm. long; stigma peltate, 1.1 mm. in diameter.

Type, *Sawada 77*, collected at Pan de Azucar, Dept. Huanuco, Peru, described as 25 ft. high, deposited in the herbarium of the Field Museum. The glandular filaments and style indicate a relationship to *M. majalis* Cogn. and *M. floribunda* (Bonpl.) DC., from which it differs in the shape

of the leaves, the character of the pubescence, and the subsessile, closely glomerulate flowers.

MICONIA PILEATA DC. Dept. San Martín: *W 6369, 6390, 7306, 7412.*

MICONIA RADULA Cogn. *Miconia sphagnophila* Macbr. Playapampa: *Macbride 4503;* Dept. Junín, Pichis Trail: *KS 25908.* A careful comparison of these two specimens with *Weberbauer 4403* and *André* (type) at Kew convinces me that the slight differences between them are of no specific significance. In the type, the hypanthial indument is composed of stout conic-incurved bristles, almost retort-shaped, their bases as much as 0.4 mm. in diameter and absolutely contiguous over the hypanthium and pedicel. In *Weberbauer 4403*, identified as this species by Cogniaux, the filaments are also glandular, but the hypanthial hairs are much more slender and proportionately longer; while they are still crowded, the actual surface of the hypanthium is generally visible between their comparatively slender bases. In *KS 25908* the hypanthium has again this indument of slender hairs but the filaments are distinctly glabrous. The presence or absence of glandular hairs on the stamens has generally been regarded of good taxonomic value and experience shows that it is seldom subject to variation or exception. Here is a case, on the other hand, where we must broaden the definition of *M. Radula* to include forms without such glands or describe a new species. If we adopt the latter alternative, we are at once faced with the disposition of the Weberbauer plant, which combines the characters of both. Under the circumstances, it seems best to include them all in *M. Radula.*

M. sphagnicola was separated from *M. Radula* because its leaves were 5-pli-nerved. I do not know whether Macbride had seen authentic material of *M. Radula* before he described his species, but infer that he had not, since the collections of André are poorly represented in America. The original collections plainly show pli-nerved leaves, and since Macbride's species has glandular filaments, it is therefore reduced to *M. Radula.*

MICONIA RUIZII Naud. Dept. Junín, Pichis Trail: *KS 25628, 25748.*

§X. *Cremanium*

Miconia aprica sp. nov. §*Cremanium*, ad *M. peruvianam* Cogn. affinis; ramis obtuse tetragonis leviter furfuraceis; foliis subcoriaceis obovato-oblongis vel ovato-oblongis 5-nerviis acuminatis basi rotundatis spinuloso-denticulatis supra scabris subtus ad venas primarias pilis ramosis obtectis ad venas secondarias sparse pilosis ad paginam glabris; paniculis ramosissimis dense stellato-pilosis, floribus 5-meris brevissime pedicellatis; hypanthio glabro rubro-punctato; sepalis triangularibus acutis, dentibus exterioribus adnatis; petalis obovatis parvis; antheris anguste obovatis 2-locellatis poro lato ventro-terminale

dehiscentibus, connectivo basi breviter producto incrassato; ovario 3-loculare multiovulato summo ad hypanthium septis 10 connexo; stylo breve crasso, stigmate truncato.

A shrub or small tree; branches stout, roundly 4-angled and shallowly sulcate when young, terete with age, glabrous below, increasingly pilose above with long branched hairs; petioles slender, 10–15 mm. long, pubescent like the stem; blades yellowish-green, subcoriaceous, obovate-oblong to ovate-oblong, 7–10 cm. long by half as wide, abruptly acuminate, rounded at base, conspicuously spinulose-denticulate, 5-nerved; primaries lightly impressed above, prominent beneath, secondaries plane above, barely prominent beneath, tertiaries obsolete above, plane and reticulate beneath, secondaries about 2 mm. apart, ascending at an angle of about 70°; upper surface scabrous with minute conical hairs; primaries freely and secondaries sparsely pilose beneath with branched hairs like those of the stem, the tertiaries and surface glabrous; panicle freely branched, 5–12 cm. long, its axes densely pilose or subtomentose with branched brown hairs; flowers subsessile, 5-merous; hypanthium broadly campanulate-hemispheric, 1.6 mm. long to the torus, glabrous, minutely and sparsely red-punctate; calyx-tube slightly spreading, 0.3 mm. wide; sepals triangular, acute, 0.5 mm. long; exterior teeth equaling the sepals in size and shape, mostly adnate; petals obovate, 1.1 mm. long, 0.8 mm. wide, rounded, symmetrical, not retuse; stamens isomorphic; filaments 3.5 mm. long, the basal two thirds widened and much thickened in the middle, the upper third slender and terete; anthers stout, narrowly obovoid, 2.5 mm. long, 2-celled, opening by a wide ventro-terminal pore; connective slightly prolonged below the pollen-sacs and somewhat elevated into a dorsal ridge; ovary half-inferior, 3-celled with numerous ovules, its free summit connected with the hypanthium wall by 10 thin radiating septa; straight, stout, glabrous, 1.6 mm. long, slightly thickened upwards to the truncate stigma.

Type, *KS 24246* collected in thickets and open woods, alt. 1800–2400 m., Huacapistana, Dept. Junín, Peru, described as a shrub 4–8 ft. high; it is in full bloom. Other specimens are *KS 24316*, from the same locality, a shrub 8–12 ft. high, in flower; *24381*, from Carpapata, above Huacapistana, alt. 2700–3200 m., a tree 15–25 ft. high, in bloom; and *22311*. from a wooded hillside at Ccarrapa, Dept. Ayacucho, alt. 2200 m., a shrub or small tree 8–12 ft. high. The latter specimen has ovate-oblong leaves and has lost most of its branched hairs. The species is related to *M. peruviana* Cogn., also from Peru, and differs in its pubescence, longer petioles, larger leaves and panicles, and glabrous hypanthium.

MICONIA CAERULEA (Don) Naud. Dept. Junín, San Ramón: *KS 24758*.

MICONIA CLATHRANTHA (Mart.) Triana. Dept. Junín, Pichis Trail: *KS 26051, 26187*.

MICONIA COELESTIS (Don) Naud. Dept. Junín, Pichis Trail: *KS 25924*.

MICONIA CYANOCARPA Naud. Dept. Junín, San Ramón: *KS 24690.*

MICONIA HYGROPHILA Naud. Dept. Ayacucho, Ccarrapa: *KS 22457;* Dept. Junín, Carpapata; *KS 24471.* The former, with leaves nearly glabrous beneath, agrees well with *Bang 722;* the latter, with leaves densely pubescent beneath, agrees equally well with *Bang 2624.* The specimens are believed to be conspecific, notwithstanding the great difference in indument.

MICONIA RAMOSIPILA Macbr. Cani: *Macbride 3411;* Tambo de Vaca: *Macbride 4341;* Muña: *Macbride 4321* (isotype).

§XI. *Chaenopleura*

Miconia Macbridei sp. nov. §*Chaenopleura;* glabra; ramis obscure 4-angulatis, mox teretibus; foliis sessilibus, coriaceis, cordato-ovatis, ad apicem obtusam acuminatis, basi cordatis, superne obscure calloso-denticulatis, 3-nerviis cum venis marginalibus adjectis; panicula parva corymbiforme ramosa, pedicellis brevibus; floribus 4-meris; hypanthio subgloboso fauce constricto; sepalis ovato-triangularibus obtusis membranaceis dentes exteriores triangulares acutos aequantibus; petalis obovatis rotundatis; staminibus desinentibus; ovario infero 4-loculare.

A glabrous shrub, the young stems obscurely 4-angled, soon becoming glabrous with the bark cracking longitudinally; leaves coriaceous, sessile, ovate, acuminate to an obtuse tip, cordate at base, 35–45 mm. long, 22–28 mm. wide, 3-nerved, with an additional pair of submarginal veins; primaries impressed above, elevated beneath; secondaries obsolete above, barely impressed below, with the tertiaries finely reticulate; panicle corymbiform, many-flowered, freely branched, 4–5 cm. long and wide; pedicels 2 mm. long; flowers 4-merous; fruiting hypanthium subglobose, 2.5 mm. long; calyx-tube minutely prolonged; sepals membranous, broadly triangular-ovate, obtuse, 0.9 mm. long; exterior teeth free, triangular, somewhat thickened at the acute apex, appressed to and just equaling the sepals; petals obovate, 2.5 mm. long, 2 mm. wide, broadly rounded at the summit, spreading; ovary wholly inferior, 4-celled: stamens and style lacking.

Type, *W 5996*, collected at Tarapoto, Dept. San Martín, Peru, alt. 750 m. Although the stamens are unfortunately lacking, the character of the inflorescence is sufficient to establish it in §*Chaenopleura*, and the 4-merous flowers and shining heart-shaped leaves show its relationship to *M. nitida* (Don) Naud., a species represented in herbaria, so far as known to me, only by the original collection of Pavon in the Herbarium Boissier at Geneva. In that species the inflorescence is few-flowered and nodding, the hypanthium and petals fully twice as large, the leaves elliptic rather than ovate and less conspicuously cordate at base, and the obvious petioles 2–4 mm. long. Cogniaux states that the calyx-lobes, by which he probably

meant the exterior teeth, are "late rotundatis"; I have not verified this point personally. It is also closely related to *M. retusa* Pilger, erroneously placed in the section *Amblyarrhena*, which has a small lax inflorescence and longer and narrower leaves.

TOCOCA Aubl.

Sect. I. *Pterophorae*

Tococa gonoptera sp. nov. §*Pterophorae;* frutex trimetralis; ramis rotunde 4-angulatis, junioribus dense longeque hirsutis; petiolis et formicariis gracilibus dense hirsutis; laminis ellipticis falcato-acuminatis crenulatis ciliatisque basi acutatis supra parce pilosis subtus ad venas majores parce setosis ceterum glabris, 3-nerviis; inflorescentia parva subumbellata terminale et in axillis superioribus; hypanthio turbinato 5-alato ad nervos inter alas setoso, alis superne ampliatis et sub apicem subito ampliatis in dentem triangularem, margine dense glanduloso-hirsutis; sepalis triangularibus acutis; petalis late obovatis vel subrotundis retusis; ovario 3-loculare circum stylum pilis discretis glandulosis ornato; stigmate lato peltato.

Stems shrubby, when young strongly 4-angled and sulcate, densely hirsute with stout, simple or minutely glandular hairs 5–7 mm. long, in age rounded 4-angled and sparsely short-hirsute; free petioles 10–15 (rarely 30) mm. long, densely hirsute; formicaria semi-ellipsoid, about 25 by 10 mm. as pressed, rather sparsely hirsute and puberulent; blades thin, bright green, narrowly elliptic, as much as 12 by 30 cm., falcately acuminate, crenulate and ciliate, acute at base, 3-nerved, with an additional pair of obscure, arcuate submarginals; veins plane above, lightly elevated beneath, the secondaries 5–8 mm. apart, arising at an angle of about 70°, the tertiaries plane and obscurely reticulate; upper surface sparsely pilose with yellow hairs 2–3 mm. long and apart; lower surface sparsely setose with similar hairs on the primaries, very sparsely setose with somewhat shorter hairs on the secondaries, and minutely and obscurely puberulent on the surface; inflorescence small, rather crowded, subumbellate, terminal and in the upper axils; hypanthium turbinate, 8 mm. long to the torus, 5-winged, densely hirsute on the margin of the wings and sparsely so on the intermediate nerves with slender glandular hairs 2.5 mm. long, elsewhere glabrous, the wings membranous, extending to the tip of the sepals, gradually widened above to 1.2 mm. and near the summit abruptly widened into a laterally projecting, triangular, acute tooth nearly 3 mm. wide; calyx-tube prolonged 2 mm. to broad but angular sinuses, very sparsely setose on the back; sepals 1.6 mm. longer, triangular, acute; petals broadly obovate or subrotund, 9 mm. long, 7 mm. wide, deeply retuse, many-nerved; filaments flat, glabrous, 1 mm. wide; anthers plump, oblong, 5–5.5 mm. long, the pore almost exactly terminal; connective elevated on the back into a low ridge and ending at base in a small obtuse protuberance; ovary wholly inferior, 3-celled, the summit rather concave, bearing at the base of the style about 50 erect,

separate, glandular setae about 0.8 mm. long; style stout, glabrous; stigma peltate, 2.7 mm. in diameter.

Type, *KS 28092*, collected in dense forest between Yurimaguas and Balsapuerto, Dept. Loreto, Peru, alt. 135–180 m. *K & S 26288*, from the same locality, and *28601*, from Balsapuerto, are the same. *T. gonocarpa* is distinguished at once by the projecting triangular tooth on the hypanthial wings.

Tococa stenoptera sp. nov. § *Pterophorae;* arbuscula; ramis vetustioribus ad nodos incrassatis glabrescentibus, junioribus valde complanatis ad marginem pilosis; petiolis crassis supra pilosis; formicariis parvis, breviter hirsutis; laminis ellipticis acuminatis minute denticulatis basi cuneatis 5-nerviis, supra setulosis subtus pubescentibus; panicula angusta axibus valde complanatis et alatis ad margines pilosis; hypanthio obconico 5-alato ad alas hirsuto, alis trans calycem productis et dentes subulatos formantibus; sepalis subtruncatis, dentibus exterioribus truncatis; petalis magnis; ovario 3-loculare semi-infero, rostro conico corona magna fimbriata ornato; stylo elongato sursum dilatato, stigmate peltato.

Small tree 5–6 m. high, the branches swollen at the nodes, with short internodes, terete and glabrous in age, when young strongly ancipitally flattened and winged, the wings densely short-hirsute on the margin, the flat sides essentially glabrous; free petiole stout, about 5 mm. long, densely hirsute on the upper side and about the base; formicaria semi-ellipsoid, 14–18 mm. long, 2-lobed, sparsely short-pubescent; blades thin, elliptic, as much as 7 by 17 cm., abruptly acuminate, minutely serrulate, cuneate at base, 5-nerved, with an additional pair of marginals; upper surface sparsely pubescent with yellowish hairs 0.6–1 mm. long and apart; lower side pubescent throughout with slender hairs 0.4 mm. long and apart and minutely glandular-puberulent on the veins; primaries and secondaries plane above, elevated beneath, the latter 3–5 mm. apart, arising at an angle of about 70°; tertiaries obscure above, somewhat elevated and coarsely reticulate beneath; inflorescence a terminal panicle 18 cm. long, its axes strongly flattened and winged, very minutely glandular-puberulent on the sides, sparsely pilose on the wings with rather crooked hairs 0.5–0.8 mm. long, the lateral branches 10–7 mm. long, decreasing above, each bearing a sessile terminal flower and 2 stout, 4-winged pedicels 8–3 mm. long, each with a terminal flower; bracts filiform, 1–1.5 mm. long; flowers 5-merous; hypanthium campanulate-obconic, 7.5 mm. long to the torus, minutely puberulent with reddish hairs, 5-winged, the wings thick and fleshy, 0.5 mm. wide, opposite the sepals, densely hirsute, continuing across the calyx and projecting 1–1.3 mm. beyond it as subulate teeth; calyx-tube prolonged 1.4 mm. to the sinuses, the sepals broadly depressed-rounded, only 0.5 mm. long; external teeth truncate, villous along the margin; petals pink, obovate-oblong, slightly inequilateral, 11.5 mm. long, 5–6 mm. wide, deeply retuse, obscurely

5-nerved; filaments flattened, 7.7 mm. long; anthers stoutly linear, 7.5 mm. long, slightly incurved at the tip, opening by a terminal pore; connective elevated into a conspicuous ridge on the back, with a basal protuberance; ovary half-inferior, 3-celled, its free summit conic-ovoid, 1.6 mm. long, surmounted by a somewhat flaring corona 3.2 mm. long with a fimbriate margin; style glabrous, 18 mm. long, gradually enlarged above; stigma peltate, 3 mm. in diameter.

Type, *KS 26280*, collected at Puerto Yessup, Dept. Junín, Peru, in dense forest at 400 m. alt. Among the few species of the section with winged hypanthia, only *T. pauciflora* Spruce shows the wings projecting conspicuously beyond the margin of the calyx; it differs from ours in its few-flowered infloresence with very slender axis.

TOCOCA STEPHANOTRICHA Naud. I have not seen the type of the species, collected by Poeppig at Maynas Alto. *Spruce 4256*, referred here by Cogniaux, is from Tarapoto, in the same general region, and presumably is conspecific. We have one specimen, *KS 25967*, collected on the Pichis Trail at 1100 m. which agrees precisely in vegetative characters with Spruce's plant, and a second, *KS 26035*, from the same locality, which is conspecific with the first but has larger and thinner leaves. This variation might be expected, since the first grew in thickets and the last in dense forest. Flowers of the Spruce plant have not been dissected by me. In comparison with the detailed description of the species by Cogniaux, our plants agree in all matters of form and dimensions except in three points, the ovary is 3-celled instead of 5-celled; its corona is erect and the hypanthial wings are narrowed to an acute angle at the summit, while Cogniaux' plate indicates a spreading corona and hypanthial wings truncate at the top. Our specimens are accordingly referred to this species with some hesitation.

Tococa temnoptera sp. nov. Ad *T. stephanotricham* arcte affinis sed recedit caule 4-angulato, formicariis gracilioribus, foliorum laminis majoribus pro rata angustioribus longiore acuminatis basi acutioribus, hypanthii alis superne truncatis vel margine exteriore paullum productis, petalis subduplo majoribus, ovarii corona horizontaliter patula fimbriata.

Stems shrubby, even in age roundly 4-angled and shallowly sulcate, when young densely hirsute with both simple and glandular hairs 5–6 mm. long; free petioles 15–20 mm. long, glandular-hirsute; formicaria slender, 3 cm. long, 6 mm. wide when pressed, hirsute; blades thin, elliptic, as much as 19 by 12 cm., sharply acuminate, nearly entire, broadly acute or cuneate at base, 5-nerved, the veins all plane above, lightly elevated beneath; upper surface freely hirsute with yellow hairs about 2 mm. long and 1 mm. apart, also minutely puberulent with very short hairs 0.2 mm. apart; lower surface setose

on the principal veins and occasionally on the tertiaries with slender hairs 1–2 mm. long, also sparsely puberulent on the surface with minute hairs less than 0.1 mm. long; inflorescence a few-flowered panicle 6 cm. long, its axis sparsely setose and densely puberulent, the 5-merous flowers nearly sessile; hypanthium obconic, 7.5 mm. long, 5-winged with 5 intermediate nerves, densely hirsute on the nerves and wings with bluish glandular hairs 2 mm. long; wings 1.5 mm. wide, continuing into the midnerve of the sepals, their tips very densely hirsute, truncate or triangular and somewhat projecting; calyx-tube prolonged 2.3 mm. to rounded sinuses; sepals ovate-triangular, 2.2 mm. long, obtuse, glandular-hirsute and densely glandular-ciliate; petals pale pink to white, obovate-oblong, 16 mm. long, 8.5 mm. wide, deeply cordate-retuse, conspicuously many-nerved; filaments flat, 7.5 mm. long; anthers stoutly linear, 6 mm. long, the connective elevated into a low dorsal ridge bearing a minute basal protuberance; ovary almost wholly inferior, 3-celled, the free tip conic, very short, surmounted by a horizontal, fimbriate-ciliate corona 4 mm. in diameter; stigma peltate.

Type, *KS 26237*, collected at Puerto Yessup, Dept. Junín, Peru, alt. 400 m., in dense forest. In comparison with *T. stephanotricha* it has glandular stems, more slender formicaria, larger and proportionately narrower leaves, which are longer acuminate, more tapering at base, and less pubescent, much larger flowers, hypanthial wings truncate above, and a spreading corona on the ovary.

Sect. II. *Hypophysca*

TOCOCA BULLIFERA Schr. & Mart. Manáos: *KS 30133*.

TOCOCA GUIANENSIS Aubl. Dept. Loreto: *KS 26974, 27292, 27348, 29763, 29877, 29883, 29996, W 1301, 1711, 3175, 3657, K 415;* Manáos: *KS 30063*. While the original locality of this species is French Guiana, herbaria usually contain a large series of specimens referred to it and ranging from Guiana to Panama, or even Central America, and throughout the Amazonian lowlands as far as Bolivia. This is an enormous range for any one species, and at once suggests the advisability of a critical examination of its homogeneity. Even the most superficial inspection shows that it covers plants with a wide range of structure, several of which will probably need to be segregated.

Nine of the specimens cited above exhibit flowers and have been carefully dissected, with rather surprising results. The chief points of difference among them lie first, in the shape and pubescence of the sepals and exterior teeth, and second, in the structure of the ovarian corona. According to the first, they may be divided as follows:

Exterior teeth triangular, conspicuously projecting beyond the sepals, bearing few or several setae.
Setae 8–12, 2–2.5 mm. long, glandular (type A).....*1301, 29883.*
Setae about 3, never more than 0.8 mm. long, glandular (type B).....*30063.*
Exterior teeth broadly depressed-rotund, not projecting or scarcely so.
Exterior teeth with several short setae (type C).....*415, 27348, 29996.*
Exterior teeth each with a single short seta (type D)...*3657, 26974, 27292, 29877.*

According to the structure of the corona:

Corona not developed (type 1).....*29877.*
Corona tubular, connate.
Corona bearing at the summit about 10 short, oblong, densely glandular-pubescent lobes (type 2).....*415.*
Corona bearing about 10 glandular bristles from triangular bases (type 3).....*1301, 3657, 27292, 27348, 29883, 29996, 30063.*
Corona of numerous distinct bristles as much as 5 mm. long (type 4).....*26974.*

This gives us four types of structure in the calyx and four in the corona. If we try to correlate them with each other, we have the following results:

Type A with type 3.....*1301, 29883.*
Type B with type 3.....*30063.*
Type C with type 2.....*415.*
Type C with type 3.....*27348, 29996.*
Type D with type 1.....*29877.*
Type D with type 3.....*3657, 27292.*
Type D with type 4.....*26974.*

Tococa loretensis Ule is of type C and type 3; *T. discolor* Pilger is of type D and type 2. The former differs from our plants of similar type in having a racemose inflorescence and merely puberulent hypanthium, while ours are paniculate with setose hypanthium. We have then apparently nine groups of recognizable forms, two of which have been, and all of which might be described as species, especially since most of them are further distinguished by other floral and vegetative characters. I believe personally that they should not be so described unless a careful examination of the whole group to which they belong justifies the action, and I accordingly refer them all temporarily to Aublet's species.

Tococa juruensis Pilger. Dept. Loreto, Pebas: *W 1617, 1685, 1940.*

Tococa micrantha Ule. Dept. Junín, Puerto Bermudez: *KS 26482;* Dept. Loreto, Soledad: *KS 29706, 29715.*

Tococa parviflora Spruce. Dept. Loreto, Balsapuerto: *KS 28511.*

Tococa Ulei Pilger. Dept. Loreto, Caballo-cocha: *W 2050, 2101.*

Tococa sp. Dept. Loreto: *KS 29763, W 1711, 3175.*

Sect. III. *Epiphysca*

TOCOCA CAPITATA Traill. Dept. Loreto, Iquitos: *KS 27434.*

TOCOCA EGENSIS Naud. Dept. Loreto, near mouth of Rio Tigre: *KS 27535*, Iquitos: *W 8036.*

Tococa glandulosa sp. nov. §*Epiphysca;* frutex bimetralis; ramis rotunde 4-angulatis praeter nodos setulosos glabris; petiolis elongatis minute furfuraceis; laminis ovato-lanceolatis, ad basin majorum vesiciferis, acuminatis basi rotundatis 5-nerviis supra glabris subtus minute furfuraceis praecipue ad nervos; inflorescentia ampla paniculata ad nodos inferiores setulosa superiores glandulosa; hypanthio obconico dense glanduloso-hirsuto; calycis tubo suberecto breve; sepalis semicircularibus; dentibus exterioribus late triangularibus glandulosis a medio subulato-acuminatis sepala paullo excedentibus; petalis obovato-oblongis; antheris superne inflexis inferne in lobos 2 rotundatos productis; connectivo dorso elevato et basi minute calcarato; ovario semiinfero, superne conico truncato pilis glanduliferis longitudine variis coronato; stylo elongato glanduloso-pilosulo.

Flowering branches conspicuously but roundly 4-angled, the internodes about 6 cm. long and glabrous, the nodes somewhat swollen, marked with a setulose stipular ring and often subtomentose in the axils; petioles rather stout, 12–15 mm. long, minutely furfuraceous, especially above; leaves slightly unequal in each pair, firm, ovate-lanceolate, 15–20 cm. long, 6–7.5 cm. wide, long-acuminate and mucronate, rounded or somewhat subcordate at base, 5-nerved, glabrous above, minutely furfuraceous beneath, especially along the nerves; secondary veins arising at right angles to the midvein, about 3 mm. apart; formicaria on only the larger leaves, ovoid, 2 cm. long; panicle rather slender, 20 cm. long, the lateral branches flattened, the principal axes essentially glabrous on the internodes, setulose and subtomentose at the nodes, the smaller branches glandular-hirsute; flowers sessile; hypanthium obconic, 8 mm. long, with leathery walls, very minutely and sparsely stellate, freely glandular-hirsute with hairs 1.5–2 mm. long; calyx-tube nearly erect, prolonged 0.9 mm.; sepals depressed-triangular from broadly rounded sinuses, 0.7 mm. long; exterior teeth continuous, broadly triangular, slightly shorter than the sepals, hirsute like the hypanthium, at the center thickened and prolonged into a subulate tooth 0.7 mm. long; petals lilac-rose, obovate-oblong, 10 mm. long; filaments flat, 6 mm. long; anthers stoutly linear, about 7 mm. long, inflexed above to a terminal pore, prolonged at base into 2 rounded lobes; connective elevated into a prominent dorsal ridge bearing a conspicuous tubercle at base; ovary mostly inferior, 3-celled, the short free beak 10-ribbed, each rib continued into an erect glandular seta 0.5–3.5 mm. long; style 19 mm. long, glandular-pubescent; stigma capitate, 1.7 mm. in diameter.

Type *K 424*, collected at Mishuyacu, near Iquitos, Dept. Loreto, Peru. It is a member of a small group of species placed at present partly in *Epiphysca* and partly in *Anaphysca* and including *T. coronata*, *T. truncata*, *T.*

lasiostyla, and *T. setifera*, from all of which it differs in its glandular-hirsute hypanthium. In vegetative characters it particularly resembles *T. lasiostyla*, which differs also in several points of floral structure.

TOCOCA LASIOSTYLA Cogn. Dept. Loreto: *KS 27426*, *W 3119*, *K 744*.

MAIETA Aubl.

MAIETA GUIANENSIS Aubl. Dept. Junín: *KS 26151*, *26544*, *26551*, *26779;* Dept. Loreto: *KS 28407*, *29509*, *29760*, *29983*, *W 947*, *1069*, *1623*, *2351*, *2563*, *2718*.

MAIETA POEPPIGII Mart. Dept. Junín: *KS 26432;* Dept. Loreto: *W 1169*, *1239*, *1571*, *1689*, *2545*, *2717*.

CLIDEMIA Don

CLIDEMIA AFFINIS (Naud.) Cogn. Dept. Loreto: *KS 28175*, *W 749*, *751*, *771*, *800*, *1900*, *3844*.

CLIDEMIA BULLOSA (Spreng.) Cogn. Pará: *Dahlgren & Sella 745*.

CLIDEMIA CILIATA Don. Dept. Ayacucho, Aina: *KS 22704*.

CLIDEMIA CORDATA Cogn. Dept. Junín, Puerto Yessup: *KS 26340;* Dept. Loreto, La Victoria: *W 2709*.

CLIDEMIA DENTATA Don. Dept. Ayacucho: *KS 22921*, *23082;* Dept. Junín: *KS 26269*, *26403*, *26440;* Dept. Loreto: *W 750*, *774*, *793*, *795*, *1275*, *1293*, *1596*, *1694*, *2040*, *KS 28625*. This common Amazonian species appears to be common and widely distributed over the lowlands of eastern Peru. Of the numerous specimens available, *KS 22921* differs strongly from the others in certain vegetative characters. The upper parts of the stem, the petioles and young leaves, the inflorescence, and the hypanthium are hirsute with bright purple-red hairs, while the leaves are considerably larger, thinner, and much more sparsely pubescent with shorter hairs than the usual form. The combination of these characters gives it a facies quite unlike the usual appearance of the species, but all the characters of flower-structure are precisely the same.

CLIDEMIA DEPENDENS Don. Dept. Junín: *KS 23978;* Dept. Loreto: *KS 27205*, *W 1461*, *K 334*, *1244;* Pará: *KS 30557*.

CLIDEMIA DISPAR (Triana) Cogn. Two fruiting specimens from Dept. Loreta, *KS 28443* and *28591*, resembling the usual form of the species in general habit but with much larger, coarsely dentate leaves as much as 14 cm. long, have been referred here but may prove to be distinct.

CLIDEMIA EPIBATERIUM DC. Dept. Loreto, near Iquitos: *KS 29885;* on the Río Itaya: *KS 29516*, *29623*. The first sheet cited is a very pubescent plant, but with petioles of the average length. The last two are smoother and the leaves are almost sessile.

CLIDEMIA FOLIOSA Gl. Dept. Loreto: *W 933*, *1058*

CLIDEMIA HETEROPHYLLA (Desr.) Gl. Dept. Junín: *KS 26744;* Dept. Loreto: *KS 28482, 28575.*

CLIDEMIA HIRTA (L.) Don. Dept. Junín: *KS 23983, 26192;* Dept. San Martín: *W 6337, 7514;* Dept. Loreto: *KS 24217, 26839, 26900, 26966, 27072, 29381, 29505, W 269, 1318, 1480, 1972, 2776, K 68;* near Pará: *KS 30298, 30390, Williams & Sella 1.*

CLIDEMIA JAPURENSIS DC. Dept. Loreta, Pebas: *W 1701.*

CLIDEMIA JURUENSIS (Pilger) Gl. Dept. Loreta, Santa Rosa: *KS 28754.*

Clidemia longifolia sp. nov. § *Sagraea;* caulibus sublignosis scandentibus inter nodos radicantibus teretibus gracilibus glabris; petiolis elongatis crassis dense hirsutis; laminis magnis oblongis acuminatis irregulariter dentatis ciliatisque basi rotundatis 5-nerviis supra glabris subtus ad venam mediam pilosis ad venulas minutissime furfuraceis ceterum glabris; inflorescentia paniculata; hypanthio subgloboso dense hirsuto; sepalis glabris triangularibus, dentibus exterioribus foliaceis oblongis patulis hypanthium aequantibus; ovario 4-loculare.

Stems climbing, rooting between the nodes, slender, terete, glabrous, with elongate internodes; petioles stout, 25–50 mm. long, densely hirsute with spreading or mostly reflexed hairs as much as 3 mm. long; blades probably unequal in each pair, thin, oblong-lanceolate, as much as 45 cm. long by 11 cm. wide, acuminate, subrotund at base, irregularly and shallowly toothed, sparsely ciliate, 5-nerved, the outer pair extending only half the length of the leaf and with a pair of additional marginal veins extending only a few centimeters, veins plane above, lightly elevated and prominently reticulate beneath, the secondaries 6–10 mm. apart, arising at an angle of about 75°, and nearly straight; upper surface glabrous; lower side glabrous on the actual surface when mature, pubescent when young, very minutely furfuraceous or pubescent on the smaller veins, freely pilose on the midvein with spreading or reflexed hairs 1.5 mm. long; inflorescence a small axillary panicle 3 cm. long with slender furfuraceous branches; pedicels 2–4 mm. long; flowers 4-merous; hypanthium subglobose, 3.2 mm. long, densely hirsute; calyx-tube spreading horizontally, 0.3 mm. wide; sepals depressed-triangular, 0.7 mm. long, glabrous; exterior teeth spreading, foliaceous, oblong-lanceolate, 3.2 mm. long, acuminate, essentially glabrous, adnate to the sepals almost to their tips; petals and stamens not displayed; ovary wholly inferior, 4-celled, its rounded summit glabrous; seeds very numerous, rounded-obconic; style not seen.

Type *K 62*, collected in dense forest at Mishuyacu, near Iquitos, Dept. Loreto, Peru, alt. about 100 m. Other specimens from the same locality are *K 554* and *KS 29948*. It is clearly a member of §*Sagraea* and related to *C. epiphytica* (Triana) Cogn., from which it differs in its smooth stems, much narrower leaves, stouter petioles, and glabrous exterior calyx-lobes.

CLIDEMIA NAEVULA (Naud.) Triana. Dept. Loreto: *KS 26927, 26967, 29670, W 792, 796, 962, 1035, 1178, 2039, 2121, 2123, 2184, K 576.*

Clidemia peruviana sp. nov. §*Sagraea;* caulibus fruticosis gracilibus subteretibus glabrisparce ramosis;petiolis gracilibus puberulentibus;laminis membranaceis oblongis abrupte caudato-acuminatis minutissime ciliatis basi late cuneatis insigniter 5-pli-nerviis, supra juventute sparse puberulis glabrescentibus venis primariis persistenter pubescentibus, subtus glabris arcte reticulatis; floribus paucis sessilibus in axillis superioribus fasciculatis 4-meris; hypanthio tubuloso minutissime puberulo; sepalis patulis membranaceis late triangularibus ad dentes exteriores oblongos foliaceos tenuissime pubescentes adnatis et multo brevioribus; petalis erectis ovato-lanceolatis apice cucullatis sub apicem breviter setosis; antheris crasse linearibus 4-locularibus, connectivo non producto; ovario 3-loculare superne umbonato; stylo gracile, stigmate capitato.

A slender shrub 10–18 dm. high, the stems above slender, subterete, somewhat swollen at the nodes, glabrous or very sparsely puberulent when young; petioles slender, 12–18 mm. long, conspicuously puberulent; blades very thin, oblong, 8–12 cm. long, 3–5 cm. wide, abruptly caudate-acuminate, entire, minutely ciliate, broadly cuneate at base, 5-pli-nerved, the uppermost laterals arising 1–2 cm. above the base; primaries plane above, lightly elevated beneath, secondaries straight, 2–3 mm. apart, arising at an angle of about 75°, plane above and beneath, the tertiaries very finely reticulate; upper surface very sparsely puberulent when young, soon glabrous, the primaries persistently pubescent; lower surface glabrous; flowers 4-merous, about 5, sessile in the upper axils; hypanthium tubular-obconic, 2.4 mm. long to the torus, very minutely puberulent; calyx-tube prolonged about 0.3 mm., very thin and delicate or scarious, the sepals of the same texture, 0.2 mm. long, depressed-triangular, almost wholly adnate to the oblong, foliaceous, minutely aristate, puberulent exterior teeth, which are erect and 1 mm. long; petals erect, subscarious, ovate-lanceolate, 1-nerved, 2.5 mm. long, cucullate at the apex and short-setose just below it on the back; filaments flat, scarious, 1-nerved, 2.5–2.8 mm. long, somewhat incurved and abruptly narrowed near the summit; anthers stoutly linear, 2.2 mm. long, 4-celled, the connective neither prolonged nor appendaged; ovary wholly inferior, 3-celled, the glabrous summit umbonate at the center; style slender, 6.5 mm. long, scarcely tapering upward to the small capitate stigma.

Type, *KS 25411*, collected near La Merced, Dept. Junín, Peru, in dense forest, alt. 800–1300 m. Its nearest relative is *C. sessiliflora* (Naud.) Cogn., of the same general region, from which it differs in the cuneate leaf-base, the conspicuously pubescent primaries, and the much smaller petals.

Clidemia procumbens sp. nov. § *Sagraea;* caulibus humilibus herbaceis vel sublignosis basi procumbentibus superne foliatis, junioribus minutissime fur-

furaceis obtuse 4-angulatis mox teretibus glabrescentibus; foliis magnis ovatis, late oblongis vel obovatis acuminatis, basi obtusis, rotundatis, vel subcordatis, obscure denticulatis ciliatisque 5-nerviis; inflorescentia solitaria subterminale ampla ramosa sparse glanduloso-pilosa, floribus sessilibus; hypanthio urceolato sparsissime glanduloso-piloso; sepalibus triangulari-ovatis.

Stems procumbent and rooting at base, herbaceous or somewhat woody, the erect portion ultimately 5–10 cm. high, leafy only above, younger portions very thinly brown-furfuraceous and obtuse 4-angled, soon becoming glabrous and terete; petioles stout, 5–18 cm. long, essentially glabrous; blades thin, ovate, broadly oblong, or more usually somewhat obovate, 20–25 cm. long by 12–15 cm. wide, or occasionally as much as 30 cm. long, the smaller members of each pair about two thirds as large as the others, abruptly short-acuminate, obscurely denticulate and evanescently ciliate, obtuse to rounded or subcordate at base, 5-nerved, glabrous throughout or minutely furfuraceous on the veins beneath; veins plane above, lightly elevated beneath, the secondaries 6–10 mm. apart, the tertiaries reticulate; panicle solitary from an upper axil, freely branched, 10–15 cm. long, its branches very sparsely glandular-pilose; flowers sessile, 4-merous; hypanthium urceolate, very sparsely glandular-pilose, toral scales none; calyx-tube not prolonged, the glabrous sepals triangular-ovate, 1 mm. long; petals and stamens not seen; ovary wholly inferior, its summit glabrous; fruit blue, globose, lightly 8-sulcate, 5 mm. in diameter.

Type, *KS 28852*, collected at Santa Rosa, on the lower Río Huallaga below Yurimaguas, Dept. Loreto, Peru, in dense forest at an altitude of about 135 m. Other specimens from the same collectors are *28423*, *28473*, *28479*, *29567*, and *29729*, all from similar altitudes in Loreto, and *26659* and *26734* from low altitudes in Dept. Junín. In four of these eight specimens the branches of the inflorescence are described as rich pink; the fruit has been noted as some shade of blue in six of them and as pink in one. All are in fruit except *28423*, which shows immature buds and was described as having red sepals. The amount of glandular pubescence varies considerably, reaching its maximum in *26734* ,where it is conspicuous without close scrutiny. The selection of a type has been wholly arbitrary and the one chosen is noteworthy for its unusually large leaves.

Clidemia procumbens is undoubtedly related to a group of little known species including *C. epiphytica* Cogn., *serpens* Cogn., *crotonifolia* Pilger, *radicans* Pilger, and *urticoides* Pilger. Of these the first two are climbers or epiphytes, with distinctly elongate stems, while in the last three the panicles are very small and compact. The habit of our plant is itself sufficient to distinguish it immediately from all its relatives.

CLIDEMIA RADICANS Pilger. Dept. Loreto, Soledad: *KS 29764*.

CLIDEMIA RUBRA (Aubl.) Mart. Dept. San Martín: *W 6359, 7644;* Dept. Loreto: *KS 29213, W 5375*.

CLIDEMIA SEPTUPLINERVIA Cogn. Dept. Junín: *KS 26481;* Dept. Loreto: *KS 28346, 29449, 29641, W 3375, 4555.*

CLIDEMIA SESSILIFLORA (Naud.) Cogn. Dept. Junín: *KS 24699, 25500, 25648.*

CLIDEMIA STRIGILLOSA (Sw.) DC. Manáos: *KS 30180.*

CLIDEMIA TESTICULATA (Triana) Gl. Dept. Junín, Dos de Mayo: *KS 25798.*

CLIDEMIA TILAEFOLIA DC. Dept. San Martín: *W 6332;* Dept. Loreto: *W 3216, 4007, 4168, 4839, 7854.*

CLIDEMIA ULEI Pilger. Dept. Loreto, near Iquitos: *KS 26949, 27081, 27207, 27475.*

BELLUCIA Neck.

BELLUCIA GROSSULARIOIDES (L.) Triana. Dept. Junín: *KS 24626;* Dept. Loreto: *KS 27978, 29215, W 643, 1588, 2073;* Pará: *Dahlgren & Sella 536.* The whole genus *Bellucia*, although containing scarcely more than a dozen described species, is sadly in need of careful study. The specimens cited have been referred tentatively to this species, pending more exact knowledge of some of the other species reported from the upper Amazon.

Bellucia umbellata sp. nov. Arbor parva; hornotinis superne 4-angulatis et complanatis, dense strigoso-tomentellis, internodis brevibus; petiolis gracilibus; foliorum laminis membranaceis fragilibus oblongis amplis acuminatis integris basi rotundatis 5-pli-nerviis, supra glabris praeter venis primariis sparse strigosis, subtus sparse puberulentibus, venis subtus crasse reticulatis elevatis; inflorescentia umbelliforme pedunculata sub-20-flora furfuracea; floribus pedicellatis 5-meris; hypanthio subhemisphaerico furfuraceo; calycis lobis brevissimis; petalis ovato-triangularibus brevibus subacutis, ad faciem superiorem ultra mediam lobos 3 tumidos deflexos gerentibus; staminibus 10, isomorphis; filamentis complanatis; antheris oblongis obtusis poris 2 terminalibus dehiscentibus; ovario infero 5-loculare; stylo elongato; stigmate capitato.

A tree 5–9 m. high, the tips of the branches 4-angled and flattened, with very short internodes, and densely brown-tomentulose with straight short appressed hairs; petioles slender, 2–3 cm. long, pubescent like the stem; leaf-blades very thin, frequently shattering into fragments upon drying, oblong-ovate to oblong-obovate, usually somewhat unequal in each pair, as much as 30 cm. long by 15 cm. wide, sharply acuminate, entire, rounded at base, 5-pli-nerved, minutely strigose on the primaries above, very sparsely puberulent beneath; veins all lightly impressed above, strongly elevated and conspicuously and coarsely reticulate beneath, the secondaries 8–10 mm. apart, ascending at an angle of about 75°, the upper primaries arising 4–7 cm. above the base and often alternate; inflorescence apparently from corky protuberances

on the old wood, umbellate, minutely furfuraceous; peduncle 1.5–2 cm. long; flowers about 20, 5-merous, on pedicels about 1 cm. long; hypanthium subhemispheric, 4.6 mm. long to the torus, broadly rounded at base, minutely furfuraceous; calyx-tube prolonged 0.4 mm.; sepals very broadly depressed, about 0.2 mm. long and 3 mm. wide; petals triangular from a broad base, 5.5 mm. long, 4.7 mm. wide just above the base, subacute, the distal third somewhat swollen and bearing at its base on the inner side a large ovoid central lobe and two lanceolate lateral lobes, all deflexed and about 1 mm. long; stamens 10, isomorphic; filaments glabrous, flattened, 5.5 mm. long; anthers stoutly oblong, 5.5 mm. long, obtuse at both ends, 4-celled, opening by 2 minute terminal pores, the thecae prolonged about 1 mm. below the dorsal insertion of the filament; connective stout, somewhat elevated along the back but neither appendaged nor prolonged; ovary small, wholly inferior, 5-celled with very numerous ovules; style straight, glabrous, stout, 16 mm. long; stigma capitate, 1.5 mm. in diameter.

Type *K 131*, collected at Mishuyacu, near Iquitos, Dept. Loreto, Peru. Other specimens from the same locality are *K 19* and *701*, in flower, and *859*, with young fruit.

The species is at once distinguished from all known species of *Bellucia* and *Loreya* by the shape, size, and appendages of its petals. In leaf-form it approaches *L. Spruceana* Benth., in which the large calyx is regularly 5-lobed with large triangular sepals.

The genera *Bellucia* and *Loreya* are not sharply distinguished, and the assignment of this species to one genus or the other is somewhat arbitrary. It has the large leaves and 2-pored anthers of *Bellucia*, the small 5-merous flowers of *Loreya*, and the petals of neither. Since 5-merous flowers are known in at least two species of the former, more weight has been given to the structure of the anthers and the plant has been assigned to that genus.

BELLUCIA WEBERBAUERI Cogn. Dept. San Martín, Alto Río Huallaga: *W 5591;* Dept. Loreto, lower Río Huallaga: *W 3969*, *7828*, near Iquitos: *KS 26898*.

LOREYA DC.

LOREYA SPRUCEANA Benth. I have referred *KS 27455* to this species with some hesitation. In the type, *Spruce 1249*, from Manáos, the leaves are more rounded at the base, the uppermost pair of lateral veins arise only 1–2 cm. from the base, the secondaries are prominently elevated beneath and 5–6 mm. apart, and the hypanthium is furfuraceous only without. In our plant, collected at Iquitos, nearly a thousand miles west of Manáos, the leaves are rather distinctly cuneate at base, the upper laterals

arise 7 cm. from the base, the secondaries are lightly elevated and 8–10 mm. apart, and the calyx-tube is furfuraceous also within.

HENRIETTEA DC.

HENRIETTEA MARONIENSIS Sagot was for many years known only by the original collection of Melinon in French Guiana, until Ule rediscovered it at Surumu in extreme northern Brazil. *KS 30170*, from Manáos, comes nearer to this species than any other, and it is accepted as this species tentatively. In the original, the hairs of the lower leaf-surface are distinctly stellate, forming a silvery tomentulose indument, and many of them end in a perfectly straight, erect seta 0.3–0.5 mm. long; the hypanthium is strigose. In the Manáos plant, the hairs on the lower leaf-surface are plumose rather than stellate, all ending in a very slender bristle, making the leaf softly pubescent; the hypanthium is hirsute rather than strigose. Our plant is distinctly not *H. horridula* Pilger, collected at Manáos by Ule, in which the hairs of the lower leaf-surface are stellate, not overlapping, and with a terminal bristle 2 mm. long, while the hairs on the hypanthium are much shorter, fewer, and heavily papillose.

HENRIETTEA STELLARIS Berg. Dept. Loreto: *W 619*, *K 746;* Manáos: *KS 30065*.

HENRIETTEA SUCCOSA (Aubl.) DC. Pará: *KS 30286*.

HENRIETTELLA Naud.

HENRIETTELLA VERRUCOSA Triana. Dept. San Martín: *W 6392;* Dept. Loreto: *W 1717, 1736, 1864, 2091, 2972*.

OSSAEA DC.

Ossaea boliviensis (Cogn.) comb. nov. *Clidemia boliviensis* Cogn. Bull. Torrey Club **17:** 94. 1890. Dept. Junín: *KS 26250, 26486, 26535;* Dept. San Martín: *W 6572;* Dept. Loreto: *KS 28338. W 1730, 3905*. Cogniaux in his original description did not mention the petals, since the plant seems to be entirely in fruit. He overlooked one or two hidden behind the sepals, which are lanceolate, long-acuminate, and with a number of hirsute bristles in the upper part. Recent collections show the structure much better: the petals are narrowly lanceolate, 1.1 mm. wide near the base, tapering thence to the apex, and 5.5 mm. long. Somewhat below the tip the membranous sides are slightly cucullate, while only the midvein is carried on to the apex, after the fashion of the external calyx-teeth which are typical of so many melastomes. The back of the petal is sparsely hirsute with straight hairs as much as 1 mm. long, and the apex above the cuculla bears several stouter hairs as much as 3.5 mm. long. The petals are quite unlike those of

Clidemia, in which they are regularly obtuse, while the cucullate structure and prolonged midvein are characteristic of *Ossaea*, to which genus the species is therefore transferred.

Ossaea bullifera (Pilger) comb. nov. *Leandra bullifera* Pilger, Verh. Bot. Ver. Brand. **47**: 169. 1905. Dept. Loreto, La Victoria: *W 3139*. The axillary fascicles of flowers, the structure of the flower, and the general aspect of the plant are all typical of *Ossaea* rather than *Leandra*.

OSSAEA CAPILLARIS (Pav.) Cogn. Dept. Junín: *KS 25318*.

Ossaea cucullata sp. nov. Fruticosa; ramis subteretibus dense furfuraceis; petiolis brevibus gracilibus dorso furfuraceis supra tomentosis; laminis membranaceis ovato-lanceolatis longe acuminatis basi obtusis integris 5-pli-nerviis supra glabris subtus minutissime furfuraceis; cymis lateralibus multifloris furfuraceis; floribus 5-meris; hypanthio cylindrico villoso et furfuraceo; sepalis brevissimis a dentibus exterioribus conicis vix superatis; petalis lanceolatis dorso furfuraceis superne involutis ad apicem cucullatam dente exteriore ovato paullum superatam; ovario 4-loculare summo villoso; stylo elongato glabro, stigmate truncato.

Branches subterete, closely brown-furfuraceous; petioles slender, 8–15 mm. long, furfuraceous below, tomentose above; blades thin, bright green, ovate-lanceolate, as much as 12 cm. long by 5 cm. wide, sharply long-acuminate, broadly obtuse and often inequilateral at base, entire, 5-pli-nerved, the laterals arising somewhat alternately; upper surface tomentulose on the midvein, otherwise glabrous, the secondaries arising at an angle of about 80°, all veins lightly impressed and finely and conspicuously reticulate; lower surface furfuraceous on the primaries, otherwise glabrous, the secondaries sharply elevated, the tertiaries plane and finely reticulate; cymes lateral, 2–4 cm. long, many-flowered, thinly furfuraceous, minutely bracteolate at the nodes; pedicels 2–4 mm. long; flowers 5-merous; hypanthium cylindric-urceolate, 2.5 mm. long to the torus, obscurely 10-ribbed, softly villous with simple hairs 0.5 mm. long; calyx-tube very short; sepals sub-semicircular, hyaline, 0.3 mm. long, barely exceeded by the stoutly conic, villous exterior teeth; petals narrowly lanceolate, somewhat inflexed, 3.5 mm. long, densely furfuraceous and sparsely pilose on the back, the hyaline sides involute above to a cucullate apex surmounted by an ovate or triangular external tooth; stamens isomorphic; filaments thin and flat, 1.7 mm. long; anthers linear, obtuse, 2 mm. long, opening by a fairly wide terminal pore; connective neither appendaged nor prolonged; ovary almost wholly superior, 4-celled, villous at the summit; style slender, glabrous, 6 mm. long; stigma truncate.

Type *K 518*, collected at Mishuyacu, near Iquitos, Dept. Loreto, Peru; it is described as a shrub 1.5 m. high, with white and dark lilac flowers. Other specimens from the same locality are *K 1116*, a shrub 1 m. high with white flowers, and *KS 29949*, a slender shrub 4–5 ft. high; also

from the lower Río Huallaga, Dept. Loreto: *W 4849, 1235, KS 28756.* Klug's second collection shows that the fruit is globose, 3 mm. long, and villous. The structure of the fruit and the 5-merous flowers show that it is of the section *Glaziophytum* Cogn. and apparently related to *O. capillaris* (D. Don) Cogn. It differs from that species in its larger and broader, almost glabrous leaves, its many-flowered, furfuraceous inflorescence, its lack of glandular hairs on the hypanthium, and its shorter exterior teeth. The petals of *O. capillaris* have not been examined. In leaf-form, even to the finer details of venation, our species is almost precisely like *Clidemia naevula* (Naud.) Triana.

OSSAEA MICRANTHA (Sw.) Macf. Dept. Junín: *KS 25974, 26425, 26503;* Dept. Loreto: *W 3465.*

MYRIASPORA DC.

MYRIASPORA EGENSIS DC. Dept. Loreto: *W 2704;* Pará: *KS 30287, 30315, 30430, 30488.*

BLAKEA P. Br.

BLAKEA CHANCHAMAYENSIS Macbr. Dept. Junín, San Ramón: *Macbride 5676, Schunke A119, KS 24620.*

BLAKEA OVALIS Don. Dept. Loreto, near Iquitos: *K 391.*

Blakea paludosa sp. nov. Arbor; ramis juvenilibus dense ferrugineo-tomentosis mox subglabratis; petiolis crassis brevibus tomentulosis; foliorum laminis coriaceis opacis oblanceolatis saepe falcatis, ad acuminem brevem obtusum abrupte angustatis, ad basin cuneatis vel acutatis, 3-nerviis, supra primum dense floccosis mox glabratis verruculosis, subtus arcte tomentosulis, nervis secondariis obscuris; floribus longe pedunculatis in axillis foliorum solitariis; hypanthio cyathiforme; sepalis ovato-triangularibus acuminatis; petalis unguiculatis lamina rotundata; staminibus conniventibus; filamentis crassis; antheris in annulum conniventibus semicircularibus biporosis; connectivo dorso elevato et ad basin in calcar triangulare erectum producto; stylo elongato basi pubescente.

A tree 4–6 m. high; the youngest branches conspicuously flattened, densely and very closely tomentose with matted cinnamon-brown hairs, later becoming subterete and subglabrous; petioles stout, 12–17 mm. long, thinly but closely tomentulose; leaf-blades rather thick and leathery, opaque, oblanceolate, 7–10 cm. long, 3–4 cm. wide, abruptly and often falcately narrowed to an obtuse acumen 1 cm. long, cuneate or acute at base, entire, 3-nerved, floccose above when young, the brown hairs soon deciduous and the mature surface glabrous and verruculose, thickly ferruginous-tomentose beneath when young, the tomentum becoming at maturity so thin and closely matted that the surface appears glabrous; secondaries obsolete above, obscure beneath; flowers solitary; pedicels single in the axils, very stout, 4 cm. long, tomentose

like the stem; hypanthium broadly cyathiform, about 15 mm. wide, deciduously floccose; sepals triangular-ovate, acuminate, reflexed, about 1 cm. long; petals pink, broadly rotund above an unguiculate base, 35–40 mm. long; filaments strongly flattened, 14 mm. long, nearly 2 mm. wide; anthers flattened, connivent in a ring, almost semicircular, 8.5–9 mm. long, 4–4.5 mm. wide, obtuse, opening by 2 minute terminal pores, the connective strongly elevated dorsally into a flat ridge and prolonged at base into an erect, flat, triangular spur 5 mm. high; ovary wholly inferior; style stout, somewhat sigmoid, 23 mm. long, enlarged distally, thinly pubescent on the lower third; stigma punctiform.

Type, *KS 25671*, collected at edge of a sphagnum swamp at Eneñas, on the Pichis Trail, Dept. Junín, Peru, alt. 1700 m. The specimen unfortunately displays but a single flower somewhat past full anthesis, and it has not been possible to ascertain its structure fully. The species seems to be related to *B. Spruceana* Cogn., differing from that plant in its oblanceolate leaves with well developed acumen, the absence of strigose hairs, the dense tomentum, the stout solitary peduncles, and the much larger flowers.

BLAKEA REPENS (R. &. P.) Don. Dept. Junín, Pichis Trail: *KS 25631*.

BLAKEA SAWADAE Macbr. Pampayacu: *Macbride 5058* (isotype); Dept. Junín, Pichis Trail: *KS 26086*.

BLAKEA SPRUCEANA Cogn. Dept. San Martín, San Roque: *W 7383*.

MOURIRIA Aubl.

MOURIRIA CAULIFLORA DC. Dept. Loreto, Mishuyacu: *K 1374*, *1410*. In the lack of authentic material of this species for comparison, these specimens are doubtfully referred here.

MOURIRIA OLIGANTHA Pilger. Dept. Loreto, lower Río Huallaga: *W 3904*.

MOURIRIA SAGOTIANA Triana. Dept. Loreto, Mishuyacu: *K 1501*.

NEW YORK BOTANICAL GARDEN

Thorn formation in Fouquieria splendens and Idria columnaris

ROBERT R. HUMPHREY

During the course of a series of investigations on *Fouquieria splendens* Engelm., and *Idria columnaris* Kellogg, two members of a little known family limited in its range to the southwestern United States and Mexico, it has been deemed advisable by the writer to give a preliminary account of thorn formation in the first of these two species.

Both plants possess a peculiarity fairly common among desert perennials—that of losing their leaves during periods of drouth and regaining them within two days to a week following periods of even moderate precipitation. This may be repeated seven or eight times during the course of a single year.

These leaves occur only when elongation of the branches is taking place, and consequently are almost never seen except during the middle to the latter part of the summer rains, before the drouth of the late summer sets in.

As the branches elongate the leaves formed at that time are composed of a small blade and what appears to be a very thick petiole. With the advent of dry weather and consequent cessation of growth, the apparent petiole is seen to split for its whole length in a horizontal plane and the upper one-quarter with the leaf blade attached falls off, leaving a stout, sharp-pointed spine.

It is currently believed among those who have observed the plant that the thorns are modified petioles, serving to protect the plant after the leaves are shed. A detailed study of *F. splendens*, however, indicates that the thorn is an outgrowth of the cortex and epidermis. The petiole is attached along its complete ventral surface to the spine, and the formation of the abscission layer preceding the dropping of the leaves is along this juncture.

The thorns of *Idria* are of the same type and are in all probability formed in the same manner.

The leaves may be divided into two types, based on their origin and manner of growth. The type most commonly observed has the general appearance of a typical mesic leaf, and occurs in clumps of two to six or occasionally more, in the axils of the rather stiff thorns with which the plant is clothed. It is these leaves which, through their loss and renewal, indicate the soil water available to the plant.

The other type is encountered less often, usually during only a limited portion of the summer and is the form of particular interest in this paper.

At the time the cork layer is forming the thorns are simple in structure, possessing a single layer of epidermal cells which are continuous with those of the petiole, while beneath the epidermis is an unbroken mass of parenchyma cells increasing in size toward the center and almost entirely without intercellular spaces. The cortical cells immediately beneath the epidermis and extending inward 1/6 to 1/10 the radius of the thorn are filled with a dense cytoplasm extending around the thorn portion of the compound structure. The petiole at this stage is much like the spine, except for the presence of the vascular system, which is much the shape of an inverted yoke extending approximately two-thirds of the way across the petiole. The leaf blade is indicated at this stage by ear-like outgrowths of the epidermis and cortex at either side of the ventral surface.

SUMMARY

1. The thorns of *Fouquieria splendens* are not formed from the leaf petiole, as commonly supposed, but are simply cortical and epidermal outgrowths.

2. Abcission of the primary leaves takes place along the whole dorsal surface of the petiole and the upper surface of the thorn.

3. The thorns of *Idria columnaris* are probably morphologically similar to those of *Fouquieria splendens*.

DESERT LABORATORY OF THE CARNEGIE INSTITUTION OF WASHINGTON
TUCSON, ARIZONA

INDEX TO AMERICAN BOTANICAL LITERATURE

1929–1931

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the work America being used in the broadest sense.

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